



AGRICULTURAL RESEARCH INSTITUTE

PUSA

PRIZE-ESSAYS

TRANSACTIONS

OF THE

HIGHLAND AND AGRICULTURAL
SOCIETY OF SCOTLAND.

NEW SERIES.

VOL. VI.

WILLIAM BLACKWOOD AND SONS, EDINBURGH,
AND T. CADELL, STRAND, LONDON.

i

MDCCCXXXIX.

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SOCIETY OF SCOTLAND.

VOL. XII.

WILLIAM BLACKWOOD AND SONS, EDINBURGH;
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LIST OF PREMIUMS FOR 1838.

..... 1839.

PRIZE ESSAYS AND TRANSACTIONS

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

PRELIMINARY NOTICE.

ON entering on a new volume, now the twelfth, of its Transactions, the Society may be permitted to express gratification at the increasing interest and value of those communications on every branch of rural economy which it is now enabled to bring before the agriculturists of the country. In adopting the plan of publishing its numerous papers periodically, and in conjunction with a popular work, the Society has had constant reason to feel satisfied with the favour with which this method of publication has been received, and its beneficial effects in eliciting useful knowledge, as well as diffusing the information obtained. While the Journal continues to command an extended and increasing circulation, the materials for future publication which are now in the hands of the Society, exceed in number and interest those which it at any time before possessed. Regarding the publication in question as an important means at the command of the Society of rendering its proceedings accessible to the farmers of the country, it is strongly recommended to all Members of the Society to support the work by becoming subscribers for themselves, and by extending its circulation into the districts where their influence extends.

Amongst the various subjects which have recently occupied the attention of the Society, there is one connected with the development of the Mineral resources of the country, to which much interest has been attached. The Society, in offering a series of premiums for geological surveys of districts of country and coal-fields in Scotland, contemplate the obtaining within a reasonable period correct geological surveys of the entire country north of the Tweed, together with detailed reports on the various portions of the great coal-fields which it contains. Although it is only about two years since this class of premiums came into operation, there have been obtained within this period geological accounts of three counties, and of a great proportion of a fourth, together with reports on two portions of the richest of the coal districts. At the last General Meeting, the Society had the satisfaction of awarding premiums, *1st*, To Mr William Montgomery, at Castle Semple, for an essay on the Geology of Renfrewshire, and the Northern part of Ayrshire; and, *2dly*, To Mr John Craig, mineral-surveyor at Woodside, near Holytown, for an essay on the Geology of North Lanarkshire, with a map and an appendix containing the details of fifty-six shaft sections. In pursuance of the same important objects, the Society, as noticed in the introduction to the last volume, had made application to his Majesty's Government to procure the publication of the materials for a geological map of Scotland, collected, at the public expense, by the late Dr MacCulloch. The application was favourably received, and Dr MacCulloch's map, with the relative memoir, has been since published. Although in this map great inaccuracies, from the causes fully explained by Dr MacCulloch himself, necessarily exist; and although omissions, in consequence of the great extent of the survey are observable, the publication of the map is important as a basis for geological observation, and the further more accurate surveys which may be anticipated. It is greatly to be regretted, not only with relation to geological surveys, but to various subjects of geographical interest, that the comple-

tion of the trigonometrical survey of Scotland should have been so long postponed. It may be a subject for consideration by the Society, whether they shall not urge upon his Majesty's Government the expediency of having this great national work proceeded with.

Of the premiums awarded by the Society, full details have been already published. It will suffice here to refer to a few of those voted at the last General Meeting in January. Of these, one was for a series of experiments on the feeding of live-stock by the employment of substances other than the common produce of the farm, to Mr Stephenson, Whitelaw, near Haddington; and one to Mr Boswell of Balmuto, for an interesting report on the comparative advantages of feeding in close houses, and in sheds or hemmels. Various premiums were awarded for communications on the pruning of forest-trees. These have been remitted to one of the Directors to methodize and prepare for publication, and a digest will be published in an early number of the Transactions. The Gold Medal was awarded to Mr M'Kenzie of Muirton, for an account of extensive plantations executed by him; and the premium for the best report on the natural fir-woods of Scotland, as well as for collecting the seeds of the wild pine, *Pinus sylvestris*, from the native forests, was awarded to Mr Grigor, Forres. To the Marquis of Tweeddale was awarded the Gold Medal for an ingenious machine invented by his lordship, and now in extensive operation, for the manufacture of tiles for draining. For communications having relation also to the preparation of tiles, premiums were awarded to Mr Robert Boyle, Ayr; to Mr James Taylor, Moorfield, near Kilmarnock; and to Mr Beart, Godmanchester. The result of these communications will appear in the present number; and in the following number will be given the essays on the practice of Tile-draining, as applicable to the purpose of the farm. For interesting papers on this latter branch of the subject, premiums were awarded to Mr James Carmichael, Raploch Farm; to Mr Stirling of Glenbervie; and

to Mr James Wilson, Freeland Erskine, near Glasgow. There were also reports on the saving of the seeds of the Italian ryegrass ; on the reclaiming of lands from the sea, and on the banks of rivers, by embankments ; on the improvement of tracts of waste ground ; and various communications on the department of machinery, and on other subjects, for which either premiums or honorary notices were voted.

In the premiums offered in the present year for future competition, the Society has not only maintained the number and variety of subjects, but has very greatly extended the funds assigned to this department. Of the premiums offered, one is the sum of 500 sovereigns for the first successful application of the power of steam to the cultivation of the soil. Notwithstanding the brilliant applications which, within a period comparatively recent, have been made of this power to locomotion and the purposes of the arts, and the favourable hopes that may thence be formed of its application to new purposes, the Society, in offering this premium, has not sought to express opinions of its own, or to excite the hopes of others ; but, seeing that a series of extensive experiments were already in progress by individuals, and that the attention of agriculturists was eagerly directed to the result, the Society felt that it would be wanting in the duty which it owed to the Landed Interests of the country did it hesitate to come forward with such support as it could give, either for the purpose of directing attention to the subject, or of rewarding discovery, should it be made.

In the class of premiums having relation to the more ordinary branches of rural economy, there are various new premiums besides those of former years which yet stand on the list. One is for reports on subsoil ploughing and trench ploughing, the recent advantages of which have been brought strongly under the notice of agriculturists by Mr Smith of Deanston. Premiums, too, have been offered for accounts of the management of watered meadows, under circumstances in which this species of improvement may be applied in moun-

tainous districts ; for the discovery or application of substances for smearing sheep, which may secure the health of the animal without deteriorating the value of the fleece ; for methods of constructing water reservoirs for agricultural purposes ; for information as to the native plants of Scotland used for dyes,—as to the effects of wood on climate,—as to particular points of cattle indicating disposition to feed,—as to the rearing and fattening of domestic fowls ; for certain information on forest culture, founded on experience ; for reports on the minerals which admit of being profitably worked, but which are not worked in any particular district of Scotland, &c.

Besides the premiums referred to in the class of *Essays and Reports*, there is another class yet more extended, having relation to useful improvements of any kind. Such are the cultivation of tracts of waste land, the improvement of pasture grounds, the reclaiming of land from the sea, and protecting it from the overflowing of rivers ; the introduction of any new species or varieties of useful plants suited to the climate, and adapted to field-culture ; and various subjects under the heads of crops and culture. For the planting of land, liberal premiums have been offered under nine distinct heads. To these is to be added a class of premiums for improving the condition, and rewarding the industry, of the labouring classes, an object which has long been regarded by the Society as a paramount duty to be attended to. The premiums to cottagers, which hold out to them encouragement to pay particular attention to the cleanliness and comfort of their dwellings, have been continued, but on a different footing, in the hope of making them more extensively beneficial, by securing the co-operation of individuals of influence, or of local associations. Instead of offering a specific number of premiums in a particular district, it is proposed to give a certain sum to each of four parishes in certain counties, or to any local association, comprehending, at least, one parish within the bounds of its operations, and that for four successive years, on receiving a guarantee from each of the parishes for an equal sum being placed

at the disposal of the Society for the same purpose, and during the same period. Premiums, too, are given for the best cultivated cottage gardens, and for promoting attention to the management of bees ; and, farther, honorary medals are given to cottagers in those districts where the regular premiums are not in operation.

The subject of Live-Stock is one to which the Society has ever devoted its especial attention, and for several years past with increased effect. There are fourteen districts in which a system of premiums is in operation for improving the breeds of cattle, each district having the premiums for three alternate years, with a grant for a fourth or additional year, provided premiums be awarded by resident gentlemen or local associations in each of the two intermediate years, to the amount of not less than one half of the sum which is given by the Society. By this arrangement each district, in almost every case, obtains the benefit of the premiums for six consecutive years. There are also as usual, numerous district competitions established for the improvement of the breed of horses, sheep, and swine. For the products of stock likewise, encouragement is given in several districts, by premiums for the curing of butter and improving the manufacture of cheese.

But the system under which the Society has been enabled to make the most effectual exertions in directing attention to the improvement of the live-stock of the country, is that of their annual agricultural meetings and general shows. By these means agriculturists are brought together from all parts of the country on the footing of friendly emulation, and the best examples exhibited of the different classes of the live-stock suited to the country. The effect of this in removing prejudice and stimulating improvement, is likely to be witnessed on every occasion on which the meetings shall be held at the same place. Thus at the last meeting at Perth, the stock produced exceeded very greatly in number and quality that which had been brought forward at the previous general meeting at the same place. Not

only were the breeds of sheep and cattle proper to the districts around seen to be greatly improved, but the superior breeds were found to be established in districts, where but a few years ago they were scarcely known, marking a rapid improvement in the stock of all kinds over a great part of the north of Scotland. The Society cannot doubt but that they will be able to witness a like gratifying result on repeating the shows at those places where they have before been held.

General shows have been already fixed to take place at Dumfries in the present year, at Glasgow in 1838, and at Inverness in 1839, and an application has been received from the northern counties to have a meeting fixed at Aberdeen in the first vacant year, which is 1840. These will be the second meetings held at each of these places under the patronage of the Society. The premiums intimated for the Dumfries meeting in the present year, in consequence of the liberal contributions of the districts more immediately interested, amount to about L.650. Those for the Glasgow meeting have been supported with corresponding liberality, and in so far as already fixed, amount to a yet larger sum, with the prospect of further funds being procured for additional premiums. The schedule for the Inverness meeting is in the course of preparation, and when adjusted will shew an extent and variety in the premiums offered, becoming the important district of country which is interested.

The Society has felt itself more particularly called upon to extend the number and amount of its premiums of all kinds, in consequence of his Majesty's Government having been pleased to place at its disposal increased means for that purpose. The Society made application for a renewal of that pecuniary aid which it had formerly received. The Chancellor of the Exchequer and the Lords of the Treasury approved of a grant being made to the Society for a limited period, out of funds especially destined for the improvement of Scotland, and, in consequence of their recommendation, his Majesty's

warrant for a grant of L.300 per annum, for five years, was received and laid on the table at the general meeting in June last.

The Society has for many years had a museum for models, 1st, Of the most improved agricultural implements and machines now in use; and 2d, of all those for which premiums have been offered and awarded. This collection is now extensive and valuable, but it has appeared that it might be still more extended, so as to be rendered more suited to the national character of the institution, and more calculated to afford useful information to the agriculturists of the country. This matter is at present under the consideration of the Directors.

A subject which has been recently brought before the Society, is the expediency of the establishment of an experimental farm for the trying of useful experiments, and carrying beneficial improvements into effect. The Directors, however, after full consideration of this subject, were unanimously of opinion that such a measure was inexpedient, and that a wiser and safer course was to encourage the agriculturists of the country to make experiments, than to attempt experiments on a farm carried on under its own directions. A report embodying these opinions was with the like unanimity approved of by the following General Meeting. The subject was again brought under the notice of the Directors by a gentleman who had taken great interest in the question, but the Directors remained of the opinion which they had formerly expressed; and upon the subject being brought before another Meeting, an almost general opinion was expressed against the Society deviating from the course which it had hitherto followed with so much success, and applying its funds to the maintaining of a farm of experiment.

Amongst the useful institutions patronised by the Society, it has ever gratification in recurring to the subject of the Veterinary School. The advantages of this excellent institution in rescuing the farmers of the country from dependence

on the ignorance of ill-educated farriers, is every year more and more felt. Deserving young men instructed at this institution, and having had the advantage while in town of attending the medical classes of the University and private lectures, are now settled in almost every district of Scotland, and too much praise cannot be bestowed upon the zeal and talent with which Mr Dick carries on the duties of the establishment.

Since the date of the introduction prefixed to the last volume of the transactions, the Society has had to regret the loss of two of its most distinguished members,—his Grace the Duke of Gordon, who died while holding the highest office of the Society, and the Right Honourable Sir John Sinclair, Bart., one of its original constituent members.

The Duke of Gordon had long taken a zealous concern in the business of the Society. He was elected President at the Anniversary General Meeting in January 1835, and he died after having intimated his intention to preside at the last General Show which was held at Perth. At the General Meeting in June, immediately following his death, the Marquis of Lothian, on taking the chair, delivered a feeling and appropriate address on the character of the noble Duke, and on the loss which Scotland and the Society had sustained.

Sir John Sinclair, from the institution of the Society, upwards of half a century ago, until his death, took that interest in its proceedings, and shewed that desire to promote all its views, which was to be expected from the active benevolence of his character, and the interest which he took in every matter connected with the Agriculture of the country. At a special meeting of the Directors, held a few days after his decease, it was unanimously resolved, that it was peculiarly fitting that the Society should mark the high sense it entertained of the character and public services of an individual who had been so long connected with the Society, and who had rendered so many services to the agriculture of his native country. A resolution embodying these sentiments was adopted, and

inserted on the records, and a deputation was appointed to attend his remains to the grave.

At the last Anniversary General Meeting, his Grace the Duke of Sutherland was elected President of the Society in the place of the late Duke of Gordon. It was conceived that his Grace had this claim upon the Society from his great possessions in Scotland, from the noble improvements he had effected upon them, and from his almost hereditary connection with the Society. The Duchess-Countess of Sutherland is one of its original constituent members, and from its first institution to the present day, has manifested the greatest interest in its proceedings.

By the new charter the Society is empowered to elect a limited number of Foreign Associates, and Honorary or Corresponding Members, resident in Great Britain and Ireland. This power has been partially acted on at the two last meetings of the Society. At the Summer General Meeting the following were admitted Foreign Associates, viz.

His Highness the Prince Esterhazy, of Hungary.

The Duc Decazes, Peer of France, President of the Council of Agriculture.

The Baron de Silvestre, Member of the Institute, Perpetual Secretary of the Royal and Central Society of Agriculture, Paris.

M. Michel de Blandow, St Petersburg.

M. Emanuel de Fellenberg, of Hofwyl, Switzerland.

And at the last Anniversary General Meeting the following *Honorary or Corresponding Members* were admitted, viz.

England:

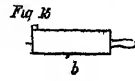
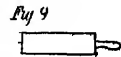
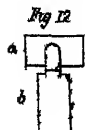
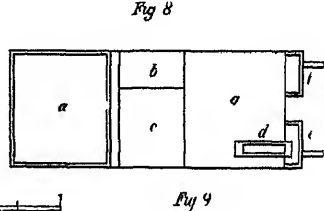
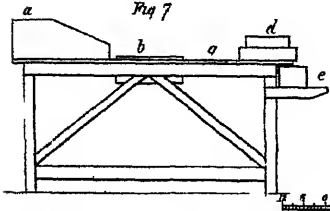
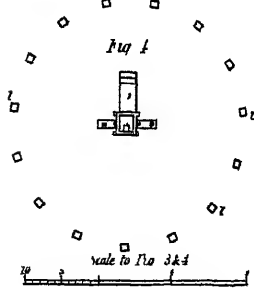
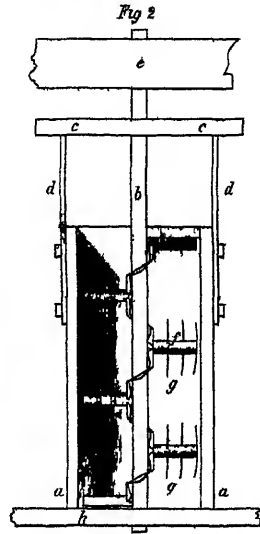
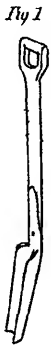
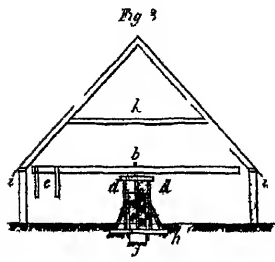
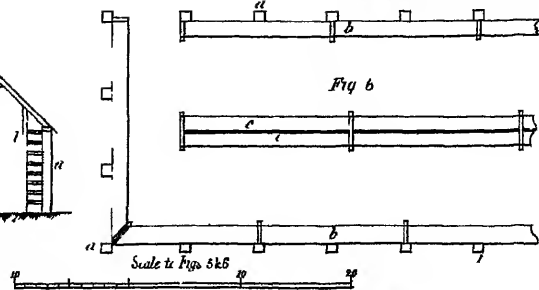
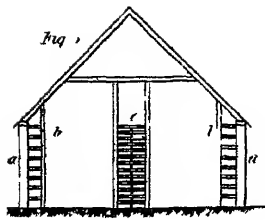
His Grace John, Duke of Bedford.

The Most Honourable Richard Plantagenet, Marquis of Chandos.

The Right Honourable John Charles, Earl of Spencer.

PLATE I

Hight's Agric. Soc. Trans. Vol.



Scale to Figs 2 & 3 10 11 12 13 14 15

Mr Boyle on the Manufacture of Draining Tiles. 11

The Right Honourable John Earl of Talbot.

The Right Honourable John Lord Western.

Thomas William Coke, Esq. of Holkham Hall.

John Heathcoat, Esq. M. P. for Tiverton.

Ireland :

The Most Honourable Henry Marquis of Lansdowne.

The Most Honourable Arthur Marquis of Downshire.

The Ordinary Members of the Society continue to increase by numerous accessions. The List, as corrected to the 31st January, will be found appended to the last volume of the Transactions. The number of the Members is now 1990.

SOCIETY'S HALL, EDINBURGH,

1st May 1837.

ON THE MANUFACTURE OF DRAINING TILES. *By Mr ROBERT BOYLE, Potter and Tile-Maker, Ayr.*

[There is perhaps no circumstance which exhibits the good sense of our farmers in a more favourable light, than the present general expression of their strong desire to become minutely acquainted with the process of tile-draining. The applications to the Society of late, on this subject, have been unprecedented. To gratify so laudable a desire for such an improvement, the Society thus takes the earliest opportunity of publishing, in the first place, the prize papers on the manufacture of tiles ; and in the following number will be given the essays on the practise of tile-draining as applicable to the purpose of the farm. The premium of Ten Sovereigns was adjudged to Mr Boyle for the following paper.]

MUCH capital has been wasted by landed proprietors who have erected tile-works, by employing people to manage them who knew little about the various processes in the manufacture of tiles. Unfortunately their incapacity for the work was

discovered only when the proprietors had suffered considerable loss, and became sickened with the outlay. A person capable of conducting the manufacture of tiles must have either served a regular apprenticeship to it, or have worked for some years in every department of the business. Such a person should be able to discriminate between different qualities, and ascertain the component parts of clay; he should know the manipulation necessary for making good tiles, and the management of the kiln, so as to regulate the heat and the draught for the proper induration of the tiles.

Having been bred to the pottery business from my infancy, and to the draining-tile manufacture since its introduction into this part of the country, I shall endeavour, in a clear manner, to describe the different branches of tile-making.

In commencing a tile-work, it is first of all essentially necessary to examine minutely the nature of the clay, whether it possesses naturally the requisite qualities, or if an admixture of sand is required to give it those qualities. *1st*, The best clay is that which requires no admixture of sand, as it is then close in texture, resists moisture, and is proof against the pulverising effects of either air or frost. *2d*, The more that clay contracts in burning, the more sand it requires to make a good tile. None of the surface soil should be incorporated with the clay to be used, as that renders it less tenacious; and the tiles made from such clay are deficient in that metallic sound always indicative of good tile. They also absorb moisture, and expand in frost.

The simplest method of judging whether clay is fit for the purpose of making tiles, is to break a piece of it, then rub the wet finger over the fractured surface until it gets smooth; then hold it up that the sun's light may be reflected from the smooth surface, and if it is full of sparkling particles of quartz or silica, the clay is good. It seldom contains too many of these shining particles. It should feel sharp and gritty in the mouth if good; if unctuous, it shews the want of the siliceous ingredient, which, of course, must be added by artificial means,

but which, of course, cannot be incorporated so intimately as by nature. The more intimate the union of the ingredients, the greater will be the beauty, compactness, soundness, and durability, of the manufactured article. The plastic character of clay is entirely owing to the alumina in it, and the plasticity is lessened in proportion to the silica which it contains.

There are many varieties of clay,—red, reddish-brown, yellow, grey, and blue. The red and brown are generally strong clay, but such as are of those colours in this country are very hard and full of small stones; when, however, the stones can be got rid of, and the mass properly prepared, they make a very solid tile, and contract little in burning. The yellow alone never does well, but when the grey or blue has yellow streaks through it, a good clay is produced. The deep blue is frequently deficient in silica, and, of course, shrinks, cracks, and twists in the burning.

The colour, however, is never a good criterion of clay. The best kind is that which is solid in the bed, absorbs, and again readily parts with moisture, inclines to turn stiff in course of preparation, is not greasy to the touch, and is easily managed in the handling. When too much silica is mixed with it, the tiles become brittle. The clay I use contains a small proportion of oxide of iron, which gives the tiles a red colour, and, by having a slight tendency to vitrification, makes them of a closer texture.

When a field of clay is fixed upon, all the surface soil and debris under it should be removed, and, if convenient, the clay should be raised at midsummer the year before it is to be used. This is best effected with narrow curved spades, such as the figure represented in Plate I. Fig. 1. The spadefuls should not exceed 3 inches in thickness, and they should be so put together as to admit a free circulation of air among them, in order that all the moisture may be evaporated, and fissures formed in the clay; and when the rainy season returns, these fissures are again filled with moisture, which,

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when acted upon by frost, completely breaks down and mol-lifies the clay. When this species of pulverization has been effected, the clay should be repeatedly turned over with spades until sufficiently mixed, then made smooth on the surface, and covered with straw or turf, to preserve the moisture in it in this state if possible for two or three years. In this manner a considerable quantity of the carbonates of lime and iron which may be present in the clay are removed, and which always injure the tiles when decomposed in the burning. But bruising rollers are excellent for obviating the pernicious effects of lumps in clay, especially when it cannot be got properly dug at midsummer. I am fitting up a set of such rollers.

In most clays are small hard nodules or lumps, which do not readily dissolve, unless exposed for a very long time to the action of the air; by this process, however, they become completely dissolved and diffused through the mass. These nodules, when not dissolved, cause the tiles either to crack in the drying or in the process of burning, and they fall to pieces and crumble away by the action of air and moisture.

Every such evil might be remedied, by exposing the clay sufficiently long to the action of drought, rain, and frost; and I would recommend every manufacturer to attend carefully to this matter, as much of the loss and many of the defects in tiles may be traced to this source.

I beg here to state what came under my observation at our black and brown ware pottery twenty years ago. Then we made pots from the clay without any previous preparation, using only spades, wooden mallets, and our feet, to bring it into a consistency fit for the wheel; three-fourths of the ware were entirely useless, and the rest of inferior quality: for if any of the pots happened to contain any of these nodules, they cracked either in the drying or burning, and the cracks could uniformly be traced to the lumps or nodules.

The pottery clay is now put through a very different process; when dug, it is exposed to the air sufficiently long to dry it; it is then broken into small pieces, put into and soaked

for some time in a pit of water, repeatedly stirred until it assumes the consistence of cream, put through a fine wire sieve, evaporated to a tenacity for the mill, then milled, and made suitable for the wheel. By these means the lumps are taken away, the clay is made more solid, the ware rarely cracked, and of superior quality.

The Milling of Clay.—The cheapest construction of mill, and which I prefer and use, is of that description known by the name of Pug-mill; it consists of a square box, *a, a*, Fig. 2, formed of 2-inch plank, 5 feet in height, and 26 inches square, inside measure; one side of which is moveable, in order to give access to the interior for the purpose of cleaning or repairing. In the centre of this box works a vertical spindle, *b*, 8 feet in length, and 3 inches square, the lower end or foot running in a brass socket, and the upper journal in a metal collar; supported by a cross bar, *c*, fixed to the pillars, *d d*, on each side of the box. A beam, *e*, is attached to the top of the spindle, one arm of which is 15 feet in length, fitted at the extremity with a yoke for the horse, by whose force the mill is turned. On the opposite end a weight may be placed, to maintain a due equilibrium, and to prevent the spindle from bending.

To the spindle are fixed eleven arms *f*, at equal distances, forming an ascending spiral, the upper arm being nearly on a level with the top of the box; these arms are four inches in breadth, and 11 inches in length, with an inclination or slope following the direction of the spiral, which gives to the clay a uniform downward tendency; nine of these arms have each eight knives, four on each side, *g, g, g, g*, attached to them, of 4 inches in length, placed parallel with the spindle, which cut and divide the clay in its progress downwards; the upper arm has no knives, but has a greater inclination than the others to take the clay quicker down into the mill; the lowest arm is also without knives, being principally intended to compress the clay. An opening or square hole is formed at

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the bottom to permit the egress of the clay ; and it is requisite to attend to the size of this opening ; for, if too wide, it will allow the clay to come away too loosely, and if too small, it will retard the speed of the milling. A mill, as here described, is secured in position by being strongly bolted down with iron-knees and stays to two beams as at *h*, laid in the form of a T ; the opening for the emission of the clay being formed at the top of the T. A shed should always be erected over the mill, to preserve the clay from rain and drought, and the workmen from inclement weather. Figs. 3 and 4 shew the general arrangement of the mill, the same letters applying to the corresponding parts of Fig. 2, while *i* marks the pillars of the shed, *j* the pit of the mill, and *k* the roof.

Clay that is to be milled in the morning, must be wheeled into a heap, and beaten solid the previous night, so that the whole may be uniformly kept moist, and fit for working, when required.

It is a bad practice, though one generally adopted where there is steam-power, to fill the barrows, run them immediately from the clay-pit, and empty them loosely into the mill. The clay thus thrown in, partly dry, and partly wet, often runs through among the knives in lumps without being cut, or it adheres more to one side of the mill than another, drops through irregularly cut, from the want of incumbent pressure, and is propelled from the mill not sufficiently amalgamated nor made solid. To remedy this defect, it is necessary to have a batch made up near to the mill, from which one, or, if necessary, two men, can cut spadefuls, supplying the mill regularly, and keeping it constantly full on all sides. A person must be always in attendance to cut it away from the bottom of the mill, throw it aside, and afterwards beat it solid, the better to prepare it for the moulders.

Shed for drying Tiles.—A shed fit to contain as many tiles as will keep a kiln burning 20,000 weekly, should be

200 feet long, and 19 feet wide inside measure, as shewn in Fig. 5 a transverse section, and Fig. 6 a portion of the ground plan, it is supported on wooden pillars, 7 feet in height, and 6 feet distant from each other. A wall-plate, 7 inches broad and 3 inches thick, properly scarfed, must be well pinned to the pillars, to support the roof. One row of shelving must run along each side, and two along the middle, varying in depth and number according to the size of the tiles; the whole of the shelving being supported with *wooden* brackets, which are preferable to every other kind. Sometimes the pillars of the roofs, and the supports of the shelves, are made of brick, which takes up too much room, checks the current of air, and retards the drying process. The shed should longitudinally lie always as nearly north and south as possible, as the best drying winds will thus blow through it. Ten feet in length of this shed can be set apart for storing dry tiles.

I prefer a thatch to a tile covering for the shed, as it is a better preventive against the influence of frost; although it must be acknowledged that the tile one is safest in case of fire.

Screens of canvass on the outside of the shed are used to protect the tiles from the rain and frost, but I believe a substitute might be got for canvass screens more economical and better adapted to the purpose, as the canvass in stormy and rainy weather is blown upon, and wastes the ends of the tiles, and is besides very liable to rot and decay. I propose to try two plans in place of the canvass screens: the first is to have a frame or hurdle made of spars, similar to a sheep-flake, 6 feet by 7, to fill up the space between the pillars of the shed, each spar to be 2 inches in thickness, a layer of drawn straw is to be packed between the spars, and cross rails nailed over all, to fix the straw between them. I would hang this screen by hinges to the wall-plate, and have hooks at bottom to keep it down in rainy weather; in drying days, on the other hand,

when it is to be kept up, a post could be fixed 7 feet from the shed, and 8 feet high, to which the screen may be fastened by the same hooks; this method, although more expensive at first, will last longer than two sets of canvass screens, and by renewing the straw, it may serve for twenty years. When properly made and fitted up, its position, when raised, will rather increase than diminish the current of air, and accelerate the drying process, and it will likewise prevent, in a great measure, the influence of frost, which too readily penetrates the canvass-screens, and stops the early manufacturing of tiles. The other substitute I would propose for canvass, are blinds similar to Venetian blinds for windows, to be turned horizontally with a screw, and placed exactly parallel and on a level with the different tiers of shelving; these would not in the least intercept the current of air.

The shed should be all in one line, if it can be so arranged; and this, I think, would be the more necessary, if the machine lately invented by the Marquis of Tweeddale comes into general use, which I have no doubt it will, and from what I know of it, I feel confident it will supersede moulding by manual labour, as it produces a superior article at a much less expense.

A shed of the above dimensions requires at least four moulders, and each moulder must have two boys, one to beat the clay into a proper shape, and take it to the moulder's table, the other to wash and carry the tiles to the shelves. An establishment of this extent consists of four moulders, eight boys, three labourers, one cutter for the mill, one burner, two horses, and a person to attend them, viz. eighteen persons, and two horses.

Moulding-Tables.—The moulding-tables, Figs. 7 and 8, of which Fig. 7 is an elevation, and Fig. 8 a bird's-eye plan, are $6\frac{1}{2}$ feet in length, $2\frac{1}{2}$ feet in breadth, and 2 feet 11 inches in height. On the left hand of the table at *a* is the moulder's

sand-box, opposite to him is his water-trough *b*, in which lies the smoothing-roller. The compartment *c* is the moulding-board, *d* the horse or bending-block, *e* is the washing-boy's water-box, *f* his sand-box, and *g* the place for the lumps of clay brought to the table by the first boy: on the moulder's right hand stands the second boy, ready to receive the tiles when moulded, he receives them on the horse, which is formed so as to give the curvature to the tile, see Fig. 9, the boy dips his hand in the water, gives the tile the proper set and smoothness, carries it to the shelf, and is back ready to receive another.

The faults in tiles are often the result of haste in moulding, the tiles not being solidly wrought nor sufficiently washed. This is frequently owing to the moulder undertaking to make them at a price per thousand, which induces him to put his work carelessly through his hand. No moulder can do justice to the making, on the present plan, of more than fifteen hundred common tiles per diem; whereas I have seen moulders make two thousand, and the consequence was they were very inferior.

On the form of the tile there is a difference of opinion, but I shall only describe those I make. The length of my tile is 14 inches, which, when burned, becomes shorter sometimes by an inch or even more; when they are moulded longer, they are apt to lose their cohesiveness, crack, and waste in the handling; and when in the kiln, do not set so firm, and are liable to twist. My furrow-tile is 3 inches in width, which may be supposed too large, but I consider a large conduit preferable, as it admits air freely, which tends much to open the soil. In fields of considerable declivity it is improper to have long runs of drains; a sub-main drain should intersect them, for which a tile is used between the size of a furrow and main, and is laid with soles. The main drain tiles are 4 inches wide, and always laid with soles.

I make also stout heavy tiles, for sewers and great runs,

6½ inches deep, and 5 inches wide, and 1½ inch thick ; these are often placed in the drains, with one over the other, the lower one inverted, as represented in Fig. 10, which makes a large conduit, and will convey nearly double the quantity of water that could be conveyed through two tiles of the same size laid in the position represented by Fig. 11. In the former, the water, by running deeper, acts with more pressure, as we find that the depth of every stream forms an essential element in determining its velocity ; drains of this form, therefore, impel sludge and every thing before them. All tiles should be a fourth higher than wide, the top rather quickly turned, and the sides nearly perpendicular. Tiles which are made to spread out at the lower edge and flat on the top, are weak and bad for conveying water. Some people prefer tiles with a flange instead of soles, but they are much more expensive in the making, do not lock close together in the kiln, nor do they answer their purpose so well ; for if placed, even in a drain with a considerably hard bottom, the mouldering of the subsoil by the currents of air and water causes them to sink, and get deranged. It is better in all soils to have soles, for when they sink by the softening of the subsoil they sink uniformly, and the loose earth is never forced up into the drain.

My tiles for main draining, for joining with the furrow-tile and sole, as represented in Figs. 12. and 13, have holes, to fit the ends of the furrow-tile. Formerly there was difficulty in getting them joined, many tiles being wasted ere they could be got to fit ; and, completely to remove the evil, I also make half and quarter main and furrow tiles to be used when required.

I prefer soles of a curved shape, as represented in Fig. 14, as they dry better in the shed, and are, consequently, less liable to crack in burning. In order to allow my flat ones to dry uniformly, I have a mould, as in Fig. 15. *a* and *b*, over which two soles are spread in a soft state, and at the one end

is a sharp-pointed iron, which cuts them nearly in two, so that, when dried, they are safely separated without injury; *a* is a transverse section, and *b* a longitudinal view, of this mould. Fig. 12, *a* is a tile for the junction of a furrow to a main drain, and *b* the sole for the junction tile. Fig. 13, shews the manner in which the furrow-tile is cut at the end to join the main-drain.

Form of Kiln and Burning process.—I consider the oblong form of kiln preferable to the circular, for it is decidedly more commodious, and burns better. One of mine, which holds 20,000 tiles of all varieties, is in length 21 feet, in width 10 feet, and 10 feet in height to the spring of the main arch, all inside measure, the arch itself having a rise of 4 feet. There are eight arched fire-places on each side, $2\frac{1}{2}$ brick-lengths apart, and each fire-place 9 inches wide by 31 inches in height, the rise of the arch of these fire-places is 4 inches, and all the fire-places are built of fire-brick. The wall of the kiln to the top of the fire-places is $3\frac{1}{2}$ brick-lengths in thickness, 3 brick-lengths in thickness from thence to the main arch, and the arch itself 1 brick-length in thickness. In all the walls every alternate course is a header. The side-vents start inside of the kiln, at the spring of the main arch, and are 7 inches square. There are nine vents in each side, and nine in the central line, and two at each end, which are between the central and outside rows. The height of the central vents is 4 brick-on-bed above the kiln, and the side ones are carried up to the same level. The side-walls are raised $2\frac{1}{2}$ feet above the spring of the arch on the outside. Four spur-arches are raised on each side of kiln on the outside, to preserve the side-walls from the effects of expansion: these spur-arches spring at the distance of 10 feet clear of the fire-places, and reach near to the top of the wall (whence the main arch of the kiln springs), and are keyed firmly at the top with freestones, 4 feet long, and 10 inches in thickness. The dimensions of the spur arches

are $2\frac{1}{2}$ brick-lengths in breadth, $1\frac{1}{2}$ in depth, and the versed side of the arches is 22 inches. The floor of the kiln is laid with solid brick on edge, and on a level with the bottom of the fire-places. Buttresses are built to the outside of the kiln at the corners and ends, 27 inches thick at the bottom, and terminating at the top of the wall. The kiln has a door at each end, the sole of the one is on a level with the floor, and is 6 feet high by $3\frac{1}{2}$ feet wide; the sole of the other is 6 courses of tile above the level of the floor, and arched over immediately below the main arch. Sheds are built at each side of the kiln, to preserve the fire-places from the influence of the weather, spaces are left in the side-walls of the shed to admit coal; and the distance of these side-walls from the fire-places is 10 feet, so as to give sufficient room for the operations of the burner. The site of the kiln is opposite to the middle of the tile-shed, and at a suitable distance from it.

In many places kilns are built with what is termed a riddled bottom, that is, arches of fire-brick are thrown across at the height of the fire-places, with a space between them, and bricks are again placed level on the top of these arches, also open, and made something like a riddle (hence its name), on which the tiles are placed for burning.

I shall now describe the setting and burning of the tiles, and notice some errors committed in the process. Tiles should not be put into the kiln until they are sufficiently dry, and moulders should never be allowed to take them from the shelves in a damp state, although it is asserted that in this state they handle better, set firmer in the kiln, heat much quicker, and, when burned, have a better colour. With the clay that we have, the better the tiles are dried they are the less brittle, set firmer in the kiln, are not bruised, and do not twist or displace one another; but when placed wet in the kiln a fire must be longer kept up, in order to expel the moisture, which, in its ascent in steam through the kiln, condenses into water, and is apt to soften the upper tiers of tiles, ren-

dering them liable to crumble down and become useless. Any sudden alternation of temperature is also apt to shiver and split the tiles in this stage. The principal care of the burner is to regulate the heat, so that the kiln may be gradually warmed to the requisite temperature, and the same care must be taken to reduce it gradually at the close of the process.

The tiles, when properly dried in the shed, should be wheeled to the kiln in barrows with flat bottoms and a front board, but no sides; the wheeler first going in at the low door, the setter commencing at the opposite end; taking particular care to have the bottom of the kiln always smooth and level, having every couple of tiles locked together, and placed in a perpendicular position. The least deviation from these precautions will endanger the safety of the whole kiln of tiles. If they get into a leaning position the heat will be retarded in its ascent, increase below, vitrify, and destroy one part, while the other will be not more than half burned; and this is one of the reasons why the riddled bottoms are preferred; but with attention and care all accidents of this nature may be prevented in the kilns I have here described.

In setting the tiles at the bottom, a thorough space must be left open, extending from each fire-place to its opposite one, and of the same width as the fire-places, forming so many thorough furnaces. The tiles between these void spaces must be packed as firm and close as possible, and carried up in layers rather above the top of the fire-places; one tile must then be advanced on each side, as far as they will stand over these voids, and the next tier covers in the void. Care should be taken to make these courses firm and level, so as to bear standing and wheeling upon them. Having thus finished the bottom, the tiles are to be brought in at the other door, and boards must be laid on the top of the tiles across the kiln, to bear the wheelers and setters; the main drain tiles should be placed in the next tiers, as they will bind those below, and leave more space to admit the heat to those above. If the de-

mand is great for soles, three rows of them along the top may be necessary, but this quantity should never be exceeded, as, from their closeness, the heat is prevented from ascending, settles below, and vitrifies the tiles. Single tiles should be placed with their mouths to the wall, each one directly above another throughout the kiln, as conductors; and, the more readily to convey the heated air, the tiles are also to be placed so regularly on each other's ends, that they may convey the heat with equal freedom amongst themselves. When the tiles are all packed in, and the kiln full, the doors must be built up with double walls of brick, between which must be packed a quantity of sand, and the surface plastered securely with clay and sand, to prevent the admission of air. When the draught is to be increased, the chimney-tops must be raised by bricks, and lowered when it requires to be diminished. The fire ought to be put into the fire-places in very small quantities at first, increasing it gradually, and in ten or twelve hours the fire-places will be full of fuel; keep on in this way, gradually increasing the heat until it is completely diffused through the whole kiln, and appears at the top; the vents must then be closed for some time, keeping the fires close below. After remaining in this state sufficiently long, and the heat having found its way to every corner of the kiln, the vents must be again opened, and the heat gradually increased until there are certain indications that it is high enough, which to a person of experience are well known. Care must be taken at this stage (and, indeed, throughout the whole process) not to let the temperature fall, otherwise the tiles will undoubtedly be shivered; when the burning is completed, close up the vents and the fire-places, and let the kiln cool by degrees, as it was heated; this gives the tiles a better colour, and preserves their integrity. A kiln of this kind, having the tiles dry when they are put in, may be burned nearly in half the time which is commonly taken, and consumes less coal.

I cannot enforce too strongly my opinion, that a want of knowledge for regulating the temperature is the main cause of the great loss which often accrues to the manufacturer, by the breaking of tiles in consequence of unequal burning; when the heat is irregularly applied it is difficult to decide on the proper time for taking it off, as the mere falling down and shrinking of the mass is an uncertain criterion. An iron grating and ash-pit should be set in every fire-place, similar to what is used in many potteries, as they save both time and fuel. The coal is often so bad and foul that long before a kiln can be brought to a proper heat, the fire-places are completely choked up, and it then becomes difficult to regulate the temperature. A kiln in this state may hang on for days without the tiles ever getting harder, for it is a mistake to suppose, if a kiln be kept on, even with deficient heat, for a considerable time, that the contents will harden. It is also a bad practice to open a kiln soon after the burning is finished, in order to cool it quickly and make it fit for drawing; the cool air rushing in causes a quick contraction of the whole mass, and makes the tiles fall to pieces when they are removed to the open air.

I prefer an oblong to circular form in kilns, and many vents instead of only one, as formerly used in Ayrshire. I disapprove of throwing coals from above into vents when they are not burning regularly, as is often practised; it destroys many tiles, and actually checks, instead of promoting, the draught. If the heat does not appear regular in the vents it were better to put more courses of brick on the top of the vents, as already stated, where there appears a deficiency, and to cover up those which are too brisk; by this means a change will take place, the slow ones will increase and the others become less active.

A register may be used below, to increase or diminish the draught, without the cool air in any measure hurting the tiles,

as it will then pass through a heated medium before it comes in contact with them.

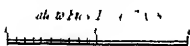
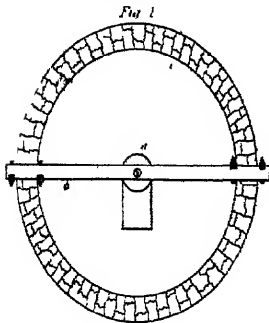
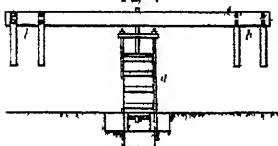
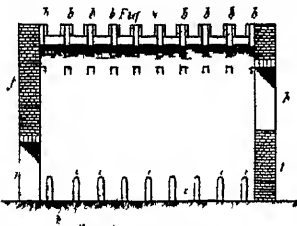
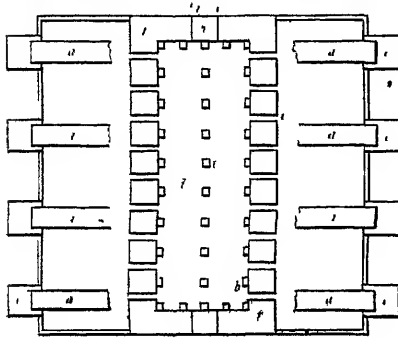
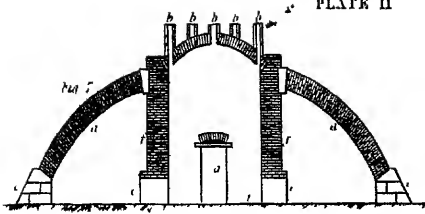
I shall not attempt to give a detailed account of the expense incurred in all the different processes of tile-making, as the price of tiles will, in a considerable degree, depend on the locality of the work, the quality and means of procuring clay, the preparation it requires, the price and quality of coal, the convenience to sand, &c.

The price of tiles, indeed, is of less importance than their durability, as on this alone their preference ought to depend. The best method, therefore, of making and burning them is of greater importance than their price, and a remunerating price must always be received, else the manufacturer will soon desist from working, or he will furnish an inferior article.

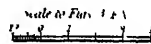
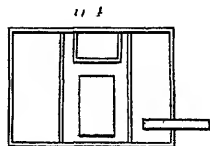
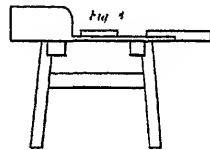
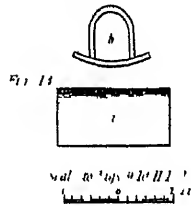
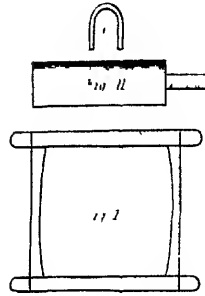
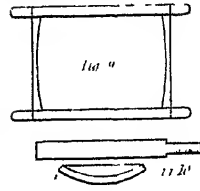
Annexed is a list of my selling prices, for which I can at present furnish a durable and workmanlike article. Owing to the increased price of coal they are higher, as will be seen from the table given below, than they were last year; at the same time, I promise, that should I, in the course of business, by subsequent discovery or persevering industry, find myself enabled to reduce these prices, I shall do so with heartfelt delight; being sincerely convinced that the result of tile-draining, in which every manufacturer as well as farmer is equally interested, will be "to make two blades of grass grow where only one grew before."

	1836.	1837.
For Large sewer tiles	80/ 1000	84/
... Main-drain do.	53/	60/
... Furrow-drain do.	26/	27/6
... Main-drain sole	30/	32/6
... Furrow-drain do.	20/	22/6

PLATE II



Bluch's Labyrinth, from Vol. VI



Scale to Feet 1 & 2

ON THE MANUFACTURE OF TILES FOR DRAINING. *By Mr JAMES TAYLOR, Moorfield, Kilmarnock, Factor to the Duke of Portland.*

[To this paper the Society's Gold Medal was awarded.]

IN 1823, the manufacture of drain-tiles was introduced into the west of Scotland by his Grace the Duke of Portland, for his estates in Ayrshire. The cost of common drain-tiles at that time was L.3 per thousand, besides the expense of erections. On opening a new clay field in 1825, with accommodation to make from thirty to forty thousand tiles weekly, the cost of common furrow tiles was reduced to 26s. 6d. per thousand. Since that time several important improvements have been made in the making of tiles, so as to reduce their cost still farther.

Clay-fields adapted for tile-making are not so numerous in Scotland as could be desired, so that few (even extensive proprietors) have it in their power to choose the proper kind of clay; but if strongly retentive clay can be found near the surface, free of stones, sand, and vegetable matter, and of the depth of 4 to 6 feet, it will answer the purpose better than that finer sort of clay which has a mixture of mud, because this latter sort is apt to get too soft on the application of water. The clay-field should be near a coal-work if possible, as the carriage of coal is expensive from a distance; and sand, being required in considerable quantities, should also be near the tile-work.

1. *Raising and Turning the Clay.*—After the depth of the clay-bed has been ascertained, a drain should be cut deep enough to take the water from its bottom, and made in such a way that the water may be retained or let off at pleasure. After the soil has been removed, the raising of the clay should commence in the beginning of winter, that it may re-

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ceive the influence of frost during the time of raising and turning. In raising, the clay should be cut with the spade in thin slices; and a cut, for this purpose, of 6 feet in depth is found more convenient than any depth beyond that; a deeper trench becoming inconvenient for turning over again. A little water should occasionally be sprinkled on the clay, and when as much of it is raised as may be considered sufficient for the tiles to be made during the following summer, it should be turned over again. Should the weather be frosty during these operations, so much the better; but should the clay be too hard, a little more water may be applied, to bring it to such a consistence that one cubic foot will sustain a weight of 160 lb., without being compressed more than one inch. After turning the clay, its surface should be smoothed over, and covered with straw to retain the moisture, until the whole mass is ready for the mill.

2. *Milling the Clay.*—When the foregoing process has been completed, the clay may be considered ready for the mill, which is represented in Plate II. Figs. 1. and 2. The first is a plan of the mill, consisting of a cylindrical barrel *a*, enclosing an upright spindle, armed with blades in the usual form; *b* is the horse beam, and *c* the course. Fig. 2. is an elevation of the mill, bearing the same letters of reference. The barrel containing the knives or cutters is kept always full of clay while the milling proceeds, the clay being removed from the bed where it was prepared by wheel-barrows, and emptied into the top of the barrel; and, owing to the position in which the knives are set, it is pressed through a hole in the bottom, the area of which is about one-sixth part of the area of the mill. The clay thus pressed out is cut and lifted by hand, and placed into a store-house adjoining, or what is termed the mill-house. This mill may be wrought either by water, steam, or horse power, as the extent of the work may require. For a small establishment fitted for making about 350,000 tiles yearly, a one-horse

mill is the most economical, as it can be erected for L.15 or L.20, and the difference of expense of a steam or water power will pay for a horse working at the mill for four or five years. But for a large establishment on an extensive clay-field, capable of making about one million and a half yearly, and where in particular the water has to be pumped from the clay-pit, steam power is preferable, as it can be made to answer both purposes at a cheaper rate than with horses.

3. *Drying Shed.*—After the clay has been once put through the mill, it is in general ready for the moulders; but before the moulder can be set to work, there must be a drying shed, table, moulds, &c. provided. A drying shed to accommodate four moulders, that should make 20,000 tiles a-week, and which should keep such a kiln going as is shewn in Fig. 6, should be 228 feet in length and 18 feet in width, with pillars either of wood or brick along the sides, 6 feet apart, and 6 feet 6 inches in height above the floor, to support the roof. To prevent the weight of the roof pressing out the pillars, a spur should be placed against every alternate pillar. A substantial wall-plate, 7 inches broad and $3\frac{1}{2}$ inches thick, is also necessary. The roof may be covered with tiles or thatch. As all clay shrinks in drying, the tile should be moulded 14 inches in length, to have it 12 inches when burned; consequently the drying shelves should be not less than 14 inches in breadth, and they may be 1 inch in thickness. The shelves are placed along the sides, and in the middle of the shed. Ten tiers of shelves may be put up along the sides of such a shed, placing them 10 inches within the pillars, supporting them upon racks rising from the floor to the height of the wall-plate, formed with bearers of wood 7 inches high by $2\frac{1}{2}$ inches thick, fixed to the upright posts, each tier of bearers supporting a tier of shelving, the space between the shelves being thus fixed at 7 inches.* A double

* As this description of the distance betwixt the shelves is made to suit

range of shelves may be placed in the middle, and by keeping the joists high enough, eleven or twelve tiers of shelves may be erected, the supports being effected in the same manner as those in the outside tiers. This leaves a space on each side of the middle tiers of 5 feet 9 inches for the moulder to work in. The middle shelves should be 2 inches asunder, so as to admit the hand to adjust the tiles; and bearers for separating these middle shelves should be $2\frac{1}{2}$ feet in length, to reach across both shelves. To preserve the tiles on the outside shelves from rain and slight frosts, it is necessary to have canvass screens hung from the wall-plate to the ground; and they may be made of any convenient length, so that they may be rolled up on the pole attached to their lower edge, and laid upon hooks fixed in the wall-plate.

4. *Moulding.*—The moulder having been furnished with a table bearing the usual appendages of sand and water-boxes, the nature and size of which will be understood from Fig. 3, an elevation of the table; Fig. 4, a bird's-eye plan, and Fig. 5, an end view. It is placed in one of the avenues of the shed. The moulder proceeds by taking milled clay from the store or mill-house, and placing the mould, which is an oblong square frame of wood bound with sheet-iron, upon the table, and throwing a piece of clay into it about two stones weight, with a force sufficient to make it fill the inside of the mould. The part of the clay that stands above the mould, is cut off with a wire stretched on a bow, and any defects that appear are filled up by beating small pieces of clay into them. A roller, about 2 inches in diameter and 18 inches in length, is then applied to smooth down the surface of the tile, which being done, the mould is lifted from it, leaving a rectangular cake of clay on

the No. 4. or common drain tiles only, it may be necessary to mention that the larger sorts of tiles require the shelves put up to suit their different sizes, namely, for No. 1, 10 inches apart, for No. 2, 9 inches, and for No. 3, 8 inches.

the table ; the cake thus formed is lifted by hand, and laid across a piece of wood named a *tile-horse*, so formed as to give the cake the proper shape of a drain-tile, which, after being smoothed a little by the hand, is carried away by an attendant and placed on a shelf for drying. It is necessary for preserving the proper shape of the tiles, that the attendant be furnished with two tile-horses, one always being left in the last made tile till another is made, and placed close by the side of it. This prevents any derangement of shape that might occur by leaving the tile unsupported on one side. When the shelves are filled on both sides of the avenue near the table, the table is moved onward another reach, and so on progressively. The time required for the tiles to stand on the drying shelves before being removed into the store-house, depends entirely on the state of the weather, but it is of great importance to have them thoroughly dry before being put into the kiln for burning. In illustration of the moulding department, Fig. 9. represents a small sole mould. Fig. 10, *a*, the horse, and *b*, a section of it for small curved soles, and *c*, section of small tile ; Fig. 11, a horse of No. 4. tile ; Fig. 12, a No. 4. tile-mould ; Fig. 13, a No. 4. tile, *b*, section of the same with its curved sole.

5. The Kiln.—I shall only notice that form of kiln for burning tiles, which is most generally approved of and in use at present, passing over a variety of forms and management, which, in the course of twenty-six years' experience, I have practised. Let it be understood that such a kiln as I am about to describe, would be capable of burning tiles quick enough to keep four moulders constantly at work, and which would, in forty weeks, produce eight hundred thousand tiles. The kiln that I consider the best for burning drain tiles sufficiently, with the least loss, and the smallest quantity of coals, is of an oblong square form, 24 feet in length, 10 feet in width, and 13 feet in height to the top of the arch, all inside mea-

sure, the side-walls being 9 feet 6 inches in height to the spring of the arch, and the arch rising 3 feet 6 inches. Fig. 6. is a bird's-eye plan with the buttresses broken off, shewing the position of the vents as well as of the fire-places; *a a* being the buttresses, *b b* the position of the vents, *c c* the fire-places, *d* the floor of the kiln, *e e* the abutments of the buttresses, and *f f* the walls: Fig. 7, a transverse section, with the same letters of reference, *g* being the lower doorway: Fig. 8, a longitudinal section, shewing the vents and the inward opening of the fire-places, with the same letters of reference.

This kiln should be built entirely of brick; eight fire-places are required in each side, the first or end fire-places being situate at 10 inches within the inside of the gables, each of them 9 inches in width, 2 feet 7 inches in height, and 2 feet 4 inches apart, lined and arched with fire brick, bedded in fire-clay mortar. The side-walls, to the height of 2 feet 3 inches, are 3 feet in thickness, where they are reduced to 2 feet 3 inches, making a break or scarpment on the outside of 9 inches. This latter strength of wall is carried to the height of 9 feet 6 inches from the floor, being the point at which the arch springs. The thickness of the arch is equal to the length of one common brick. The side walls are lastly raised to the height of 12 feet from the floor. The whole of the inside of the kiln requires to be built with fine clay mortar. To insure a regular heat throughout the kiln, there must be a range of small vents along each side and along the crown of the arch, each range equal in number to the number of fire-places. These vents have an aperture of 7 inches square; and besides them, there must be five vents in each gable; the side vents being placed right above the centre of the space betwixt two fire-places. A door is required at each end of the kiln, the one, *g*, to have its sole on a level with the floor and 5 feet 6 inches in height by 2 feet 10 inches in width, so as to admit a wheel-barrow freely, covered with a cast-iron plate 2 inches in thickness, and a 9

inch arch of brick thrown over above the iron plate to support the end of the kiln. The other door at *h*, Figs. 6 and 7, in the opposite end of the kiln, has its sole at the height of 5 feet 6 inches above the level of the floor, of the same width as the other, and 6 feet in height, covered with a 9 inch arch of brick. To prevent the weight of the arch from pressing out the walls of the kiln when fire is applied to it, four arched buttresses *a a* are erected on each side, each 18 inches in width by 13 inches in depth: these arches spring from stone abutments *e e*, which are placed at the distance of 9 feet from the walls of the kiln, giving room for the fireman to perform his operations. The spaces thus enclosed are roofed over and closed at the ends, except a door-way for admitting the fireman to pass and repass with a wheel-barrow; by this the admission of air can be regulated to suit the state of the fires.

6. *Method of Filling the Kiln.*—We may now suppose that there is a sufficient number of dry tiles in the store and drying sheds to fill the kiln. The tiles must be taken in on wheelbarrows at the low door *g* in the first instance, and the setting of the tiles commences at the opposite end, which is filled as high as the bottom of the high door *h*, Fig. 8, by setting five tiles deep on end; in coming along with this bench of five tiles deep, an open space must be left opposite each fire-place, nine inches wide, to the height of three tiles, where it is gradually brought in till it be closed with the fifth tier of tiles. These open spaces must extend from each side to the middle of the kiln, where a barrier of tiles are set to prevent the draught of air from one side injuring that of the other. When this bench of tiles is completed, the tiles must then be taken in at the high door *h*, the setting commencing at the opposite end as before; and by laying a few mats and light planks over the tiles of the under bench, to preserve them being injured by barrows or the feet of the workmen, the mats and planks being shifted as the filling proceeds. The height of this bench should ex-

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tend to six tiles on end, which may be all set as close as their form will admit, except that open spaces under the end vents must be left by setting the open sides of the tiles to the gables; the soles, being nearly flat in their shape, should be set as open as possible, and at the same time set so as to keep them upright, reversing their position every four or six soles; they should be placed in two or three tiers at the top. When this bench is finished, the filling of the kiln is completed; the doors at the ends are then to be built up with a wall of brick on bed, keeping the building about four inches free of the tiles, which space may be filled about half way up with small coal; this wall should be plastered over with mortar composed of earth and sand, in order to make the doors air-tight. A second building is required about four inches free of the first, the space betwixt them being filled with sand, an opening being left at the top to put in more sand when it subsides with the heat, and when ultimately filled up, the whole may be plastered over on the outside with mortar as before.

7. *Firing the Kiln.*—After the tiles are set in the kiln, and the doors made completely air-tight in the manner described, the firing may be commenced by lighting small fires in each of the fire-places; these should be of very moderate heat for twelve hours, after which they may be cautiously and gradually increased in heat for the next twenty-four hours, when the tiles in the middle of the kiln at the bottom should have come to a red heat. In this stage of the process, about fifteen pounds weight of coal in small pieces may be thrown through each fire-place into the middle of the kiln; and, by continuing to increase the heat in the fire-places for twelve hours more, the tiles from top to bottom will have approached near to a melting heat, when the vents should all be closed by placing a couple of bricks on the orifice of each. About an hour after the vents have been closed, the fire-places should

also be closed with coal, and kept so for ten hours, in order to keep out the air, which is very injurious to the tiles in this stage of the firing. At the expiry of that time, the fire-places may be opened a little, and the side vents uncovered, or wherever the tiles seem to be in want of burning. This increase of draught may be continued for five hours, when all the vents may again be closed, and an hour afterwards the fire-places may also be closed with coal as before. In this state the kiln may continue for four hours, when the fires may all be pushed into the heart of the kiln, and the fire-places covered with ashes or any incombustible rubbish. In the course of twelve hours more the fire-places, vents, and doors may be opened by degrees for cooling.

Various trials have been made to burn drain-tiles in kilns with false bottoms or permanent flues, built with fire-brick and covered with a kind of net-work of the same materials; but these permanent flues are very expensive to uphold, besides the outlay of their first cost, which is considerable; there is also such a waste of heat in the flues before it can reach the tiles, that a greater quantity of coal is required to burn them in a kiln of this construction; and there is besides a great loss of space, as the flues occupy as much of the kiln as would contain from four to five thousand tiles.

8. *Cost of Drain-Tiles.*—In estimating the cost of tiles per 1000, as exhibited in the annexed table, I shall consider the depth of earthy covering above the clay to be twelve or fifteen inches, the bed of clay six feet in depth, three cubic yards of clay sufficient for making 1000 common drain-tiles, with coal and sand not more than half a mile distant from the tile-work,—

Removing the earth,	L.0 0 2
Raising, watering, turning, and smoothing the clay,	0 1 2
Milling,	0 1 8

Carry forward, . L.0 3 0

(2 c)

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	Brought forward,	.	L.0	3	0
Moulding,	.	.	.	0	5 0
Setting in and drawing out of the kiln,	.	.	.	0	1 4
Fireman's attendance night and day,	.	.	.	0	0 8
Coals,	.	.	.	0	2 6
Loss by setting, firing, &c.	.	.	.	0	1 0
Loss by frost and incidents,	.	.	.	0	1 0
Sand for moulding and straw for covering the clay,	.	.	.	0	0 6
Upholding the kiln,	.	.	.	0	1 3
Upholding moulds, barrows, planks, and other incidents,	.	.	.	0	0 9
Superintendence,	.	.	.	0	1 0
				<hr/> L.0 18 0	

9. *Sale of Tiles.*—The cost of tiles stated here includes merely the upholding of every thing connected with the work after the erections have been completed, and every necessary tool and implement furnished. It is not easy to establish a general rule for the selling price, so as to meet every expense, as that must depend on the value of the land occupied by the work, the extent of ground taken up by roads, and many other incidents,—such as the surface where the clay is taken from, rendered useless for cropping ever after, but which might have let for 30s. yearly per acre. Taking the land at this value, estimating a road to be made of one-fourth of a mile, and supposing the clay-bed to last ten years, I consider that tiles may be sold at the following rates, after making allowance for every possible expense :—

No. 1 tiles, 12 inches long, 5½ inches wide, and 6½ inches high, inside measure, per 1000,	.	.	.	.	L.3	5	0
No. 2 tiles, 12 inches long, 5 wide, and 6 high,	.	.	.	.	3	0	0
No. 3 — 12 — — 4 — — 5 — —	.	.	.	.	2	10	0
{ No. 4 — 12 — — 3 — — 4 — .	.	.	.	.	1	5	0
{ or common drain tiles,							
No. 5 tiles, 12 inches long, 3 — — 3½ — .	.	.	.	.	1	2	6
Large soles for Nos. 1 and 2 tiles, 12 inches long by 10 broad,	.	.	.	.	1	5	0
Small do. for Nos. 3, 4, and 5 tiles, 12 — — 7 —	.	.	.	.	1	2	6

These prices are what drain-tiles are actually sold at in the

neighbourhood of Kilmarnock ; and, as far as I know, they are cheaper than any drain-tiles of the same size and strength in any part of England at the present day. The tiles No. 4 and 5 are chiefly used in furrow drains. Nos. 1, 2, and 3, are only used for main drains or outfalls, where there are heavy runs or feeders of water.

10. *Cost of the Erections.*—The whole buildings and erections, including a kiln to hold 20,000 common furrow drain-tiles, a drying shed 228 feet in length, store-houses for the milled clay and for the dry tiles, 24 feet in length each, and a horse-mill, may be estimated as under :—

<i>Kiln.</i>			
Common brick, 35,000 at 20s. per 1000,	.	L. 35	0 0
Fire brick, 3500 at 80s.	— . .	14	0 0
Fire-clay, 10 tons at 20s. per ton,	. .	10	0 0
Lime and sand,	. . . .	3	10 0
Mason work,	. . . .	25	0 0
Wood and wright work,	. . . .	3	10 0
Tiles for roofing the sheds at the sides of the kiln,			
and workmanship,	. . . .	5	0 0
		<hr/> L. 96 0 0	
<i>Drying Shed</i> , agreeably to the description given,			
228 feet in length, at 20s. per foot,	. .	L. 228	0 0
<i>Mill-house</i> , or <i>Store</i> for milled clay, 24 feet in			
length,	. . . .	12	0 0
<i>Store</i> for dry tiles, same length,	. .	12	0 0
		<hr/> 252 0 0	
<i>Implements.</i>			
4 Moulding tables,	. . . .	4	4 0
4 Small tile moulds, and 8 tile horses,	. .	1	6 0
4 Sand, and 4 water boxes,	. . . .	1	4 0
2 Pair of steps,	. . . .	0	10 0
10 Wheelbarrows,	. . . .	16	0 0
Spades, and sundry small articles,	. . . .	2	0 0
Planks for runs, to the length of 180 feet, 12			
inches in breadth, and 3 inches in thickness, at			
7d. per lineal foot,	. . . .	5	5 0
		<hr/> 30 9 0	
<i>Horse-Mill</i>,	. . . .	17	0 0
		<hr/> L. 395 9 0	

11. *Sizes of Moulds.*—There is a considerable difference in the shrinkage of clays when brought under the processes of drying and burning; the light fine clays generally shrink more than those that are more solid and heavy in their original state; and as it is the latter kind that I am at present engaged with, I shall give the dimensions of the moulds required to produce tiles of the sizes enumerated above.

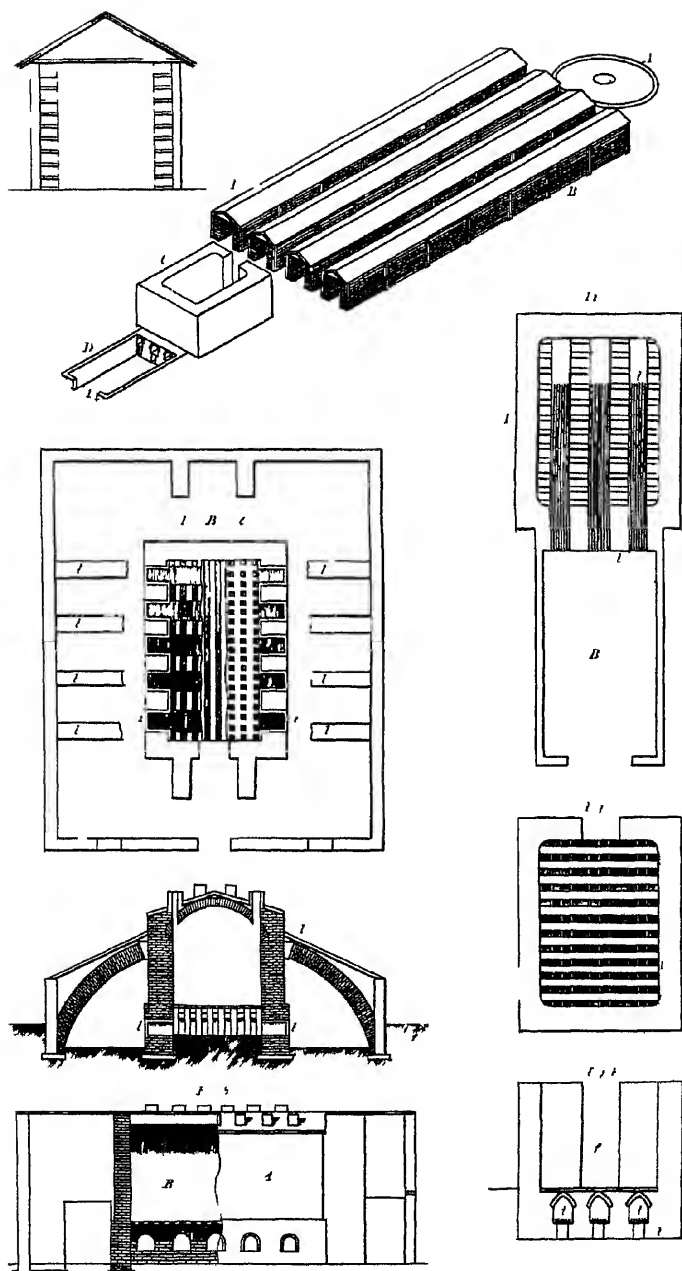
	Length.	Width.	Thickness.
No 1 tiles,	13 inches,	19 inches,	$\frac{7}{8}$ ths of inch.
No. 2 —	13 —	17 —	$\frac{7}{8}$ ths —
No. 3 —	$13\frac{1}{2}$ —	$13\frac{1}{2}$ —	$\frac{7}{8}$ ths —
No. 4 —	$13\frac{1}{4}$ —	11 —	$\frac{7}{8}$ ths —
No. 5 —	$13\frac{1}{8}$ —	$9\frac{1}{4}$ —	$\frac{7}{8}$ ths —
Large soles,	13 —	12 —	$\frac{7}{8}$ ths —
Small do.	13 —	$8\frac{1}{2}$ —	$\frac{7}{8}$ ths —

In conclusion, I may be permitted to say, that the foregoing statements are all of them founded on practical experience.

[Since this paper was ready for the press, Mr Taylor has communicated that he has tried the experiment of using grates and fire-doors on the fire-places of the kiln; and by this contrivance, finds a saving of coal effected of one-third of the former quantity used, and that the small or slack of coal answers the purpose equally well for burning tiles as the coal itself—ED.]

ON AN ECONOMICAL METHOD OF MANUFACTURING TILES
AND TILE-SOLES FOR DRAINING LAND. *By Mr ROBERT
BEART, Godmanchester, near Huntingdon.*

IN writing upon this subject, difficulties occur in forming a system universally applicable. If it were intended to meet the wants of one locality alone, the qualities of land to be drained, whether clay, gravel, or bog, &c. would regulate the size of the tiles, or tile-soles, most suitable for the purpose; and the nature of the clay would point out the peculiar mode of preparing or tempering required. The expense and process of firing the kilns would be regulated by the facilities of procuring coals, peat, or wood; and where, in like manner, the



form of the kiln would be modified by the description of fuel made use of in burning. But as the object of this essay is of the more comprehensive nature of affording general practical information upon the several divisions of the subject, it is proposed to treat of them in the following order.

1. *As to the form of kiln, drying-sheds, &c.*—The best form of kiln has been found to be that which is delineated in Plate III. Fig. 2, 3, 4. The kiln and hopper should be sunk about five feet in the ground, so as to bring the floor above the furnaces on a level with the surface of the ground. The top of the kiln should be arched over with solid brick-work, with small flues running through it, or a wrought iron roof covered with pantiles or slates. This form of kiln is well adapted for burning tiles, with a single course of bricks set upon the floor of the arches, and it can be filled entirely with tiles, and is calculated to burn every description of fuel. If the coals choke, or clinker in the furnaces, or produce a great quantity of cinders, the burner is enabled to keep them clear from such obstructions with greater facility than in any other description of kiln. If wood or peat is burned, the furnace bars are not used, and the height of the furnaces from the ground to the arch for burning peat should be reduced; but for brush or billet wood, it will require the extent of flue shewn in Fig. 2. Where kilns intended to burn tiles are fired from the two sides, as much of the bottom of the kiln as is practicable should be made permanent with fire bricks, so that but few unburnt bricks may be required before the tiles are set. This plan of constructing the bottom of the kiln permanently not only saves both time and labour in filling and unloading the kiln, but simplifies the setting of the kiln so much, that with a little instruction any labourer may perform the work. It may be supposed that by this plan there is a loss of fuel, inasmuch as, in constructing the flues with unburnt bricks, they could be burnt without any greater consumption of fuel; but this supposition is erroneous, for were an immaterial consumption of fuel thus saved, the time lost in

setting, burning, and unloading the kiln, is more than equal to the value of the bricks, which are generally of very inferior quality when burnt in the flues or on the bottom of the kiln.

As the economical manufacturing of a considerable quantity of tiles depends very much upon the convenience of drying them, and upon a sufficient extent of shelves to allow the uninterrupted continuance of the work, and as a regular supply of tiles for the kiln is of the first importance, it is necessary to direct attention to the construction of the drying sheds exhibited in Figs. 1 and 5, which can not only be erected at a comparatively small expense to that at which drying sheds in general are constructed, but combine to a greater extent the convenience for making and drying tiles. The four sheds, shewn in Fig. 1, are calculated to contain 18,000 thorough draining tiles, which is equal to the quantity a machine hereafter to be noticed will produce in one week, and which gives generally sufficient time for the tiles to remain on the shelves. The method of using the sheds most advantageously is, first, to cover all the shelves with soles, and when this is done, to pack them on the top shelf in the succession in which they were deposited, when the lower shelves are required for filling a second time with tiles. When the sheds have been thus gone over a second time, recommence in the same order, and stack the tiles (not the soles) on the bottom of the sheds as fast as the shelves are required for filling a third time. By observing this system the drying shelves will be filled three times, once with soles, and twice with tiles, before it will be necessary to remove any of the tiles from the sheds in which they are made. Thus 24,000 tiles and the same number of soles will be produced for the kiln every fortnight; and sufficient room reserved on the drying shelves for the uninterrupted working of the machine.

2. *Machinery and implements calculated to abridge labour.*—The only machine of which I have had experience or any knowledge, for making draining tiles or tile-soles, is my patent tile-machine. The advantages of this machine over hand-

moulding are, first, the simplicity of its operation, as it may be worked by any steady common labourer, who can mould with it from 16,000 to 18,000 tiles, or 40,000 tile-soles per week, with the assistance of two boys to remove and set them upon the drying shelves. And, secondly, as shewn in the calculation of the expense of the process of manufacturing tiles, a considerable saving is effected in the charge per thousand to what is paid for moulding by hand. This machine does not exceed $1\frac{1}{2}$ cwt., so that it may be moved with the greatest facility about the sheds or yard as required, which obviates many of the difficulties that arise from a stationary machine, whether worked by horse or other power. The price of a hand or movable machine is small, compared to the cost of the appropriate machinery for working the same as a stationary one. This patent machine, on its first invention, was worked as a fixed one by horse power; but the expense of conveying the tiles to the drying shelves was greater than the saving effected in moulding. It was also found to be impossible to remove the tiles without their sustaining injury, as well as using a considerable quantity of sand (particularly for the tile-soles) to prevent adhesion to the barrows upon which they were removed. With a movable machine no sand is required, as it is worked in the sheds, and the tiles are placed as they are made upon the drying shelves. The number of tiles which a hand machine will produce, is somewhat regulated by the number of boys employed to remove them, but it is found that if a greater number than from 16,000 to 20,000 per week is made, the tiles are of inferior quality, from the boys not having sufficient time to set them properly upon the drying shelves.*

3. *Shape and size of tiles and soles.*—The best shape of tile is the common draining tile and the tile-sole, not only be-

* A correct figure of Mr Beart's tile-machine, with minute instructions for working with it, will appear in the next number of the *Transactions*. Should any person be desirous of seeing the machine, in the mean time, their desire may be gratified by calling on Mr Slight, in Edinburgh.—Ed.

cause combined they are more permanent when laid in a drain, but the facility of manufacturing them is greater than that of any other form of tile. A common tile and sole (the two) can be produced at a less charge than any other description of tile varying in form from them. Tiles with wings or feet, &c., which are intended to prevent their sinking in the drain, are more expensive to mould, require a greater extent of shelves for drying them, and occupy more room in the kiln. It may be calculated that a kiln which will hold 30,000 of the common draining tiles, and the same number of soles, would not contain more than 20,000 winged tiles of the same size, as they will not lock into each other like common tiles. Thus in every part of the manufacture, considering the quantity required to be produced, the cost of moulding, facility of handling, occupation of drying-shelves, kiln-room, and economy in burning, it is evident that the common tile and sole are best, both for the manufacturer and consumer.

No absolute rule can be laid down as to the size of tiles best calculated for draining, which must vary according to the description of land to be drained. As a general principle, tiles should not be made of too great length. In tiles of great length, where the clay contracts much in drying, or is of inferior quality, the waste by the breaking of them is considerable. The length found most convenient to be moulded is $13\frac{1}{2}$ inches, which can be handed about by the boys with facility. It is scarcely necessary to allude to pipe tiles for draining. The quality of clay necessary for their manufacture, the expense of making, the difficulty of drying and burning them, are effectual barriers to their being brought into general use for draining.

4. *The quality of clay most suitable and the method of preparing it.*—In the manufacturing of tiles, the selection of clay must be in some degree guided by its proximity to the place where they are intended to be sold or used, and the facility and cost of obtaining fuel. The best clay for making tiles, whether it assumes a blue or red colour, is that which is

most free from shells and stones—limestone in particular—and which should be incorporated with a fair proportion of fine sand or marl, which will burn hard, whether white or red, and which will not decay by exposure to the weather, or crush by pressure in the drains. The marl is common clay, containing an intimate mixture of calcareous earth. Tiles made from clay without any admixture of sand or marl, are more apt to get out of shape, by contraction in drying, than tiles which are made from clay incorporated with a proper proportion of either of them. To prepare the clay for hand or machine making, it should be raised in winter, first covering the full space which will be necessary to contain a sufficient quantity of clay for the season, about one foot thick ; if the clay requires sand or marl, spread a thin layer equally over the whole, then another layer of clay, and so on, till the quantity required is accumulated. By this plan the sand or marl will be mixed equally with the clay, and the clay become exposed to the full influence of frost during the winter. Before the commencement of the season for tile-making, the clay must be turned once over with water, being cautious that too much water is not used, or the clay will be too soft when ground ; in the crude state in which the clay will then be, it should be covered over with a small quantity of straw to keep out the weather, and as it is required for making tiles pass it through a common pug mill. If the clay contains a great quantity of small stones or other substances, where there is a plentiful supply of water, it is advisable to wash it, which is the most effectual mode of clearing it ; where this cannot be done, it must be passed through iron rollers to crush the stones, and if they are limestones or shells they must be pulverized very fine, or the tiles, after they are burnt, will be filled with small fissures, by the moisture of the atmosphere slaking the small particles of lime, and making the tiles unsound.

5. *Process of Firing.*—The process of firing must be regulated by the construction of the kiln, the description of fuel used, whether coal, wood, or peat, and the peculiar na-

ture of the clay made use of, which will be variously affected when exposed to the influence of heat. Clay containing a large proportion of sand will bear the application of a strong heat as soon as the kiln is lighted, and clay which has little or no sand incorporated with it will require the heat first to be applied moderately, and gradually increased for four or five days, before an intense heat can be applied. The process of firing the kiln represented in the plate, is first to make small fires in the entrance of the furnaces, gradually increasing and extending them as the tiles in the kiln become heated, and when they are in a state to bear the full heat, the mouths of the furnaces should be partially closed above the grates with bricks laid in clay, sufficient space only being left (twelve inches square) for throwing in coals, before which space an iron door is placed, and removed only by the burner for the purpose of supplying fuel. After the mouths of the furnaces are thus bricked up, it will require about forty hours to finish burning off the kiln. This part of the subject is purely practical, as none but an experienced burner can tell, from the appearance of the flues, when the fires are very strong, how to regulate them, that the heat may not become so intense as to vitrify the tiles; or prevent the fires getting so low as to reduce the heat so much that a greater consumption of fuel than is necessary may be required again to raise it to the proper temperature. In firing the kiln with peat or wood, the same process obtains, except that there are no furnace bars used in the furnaces.

6. *Detailed account of the expense of the different stages of the process, and at what prices tiles and soles can be sold by the manufacturer.*—The price at which tiles can be produced and sold by the manufacturer, depends upon the system pursued, and the convenience for making a large quantity during the season. Where the system detailed in this essay is adopted, and there is sufficient extent of drying shelves to keep a machine at work, the following is a statement of the average cost per thousand:—The expense of raising and preparing the clay and cost of fuel will vary, but the

average expense of producing tiles per thousand, under ordinary circumstances, each tile to contain 100 cubic inches of clay, making a proportionate allowance for tiles containing a greater quantity, and a similar reduction for tiles containing less, and the price of coals being calculated to be 17s. 6d. per ton, is as follows :—

Raising the clay per thousand, each tile to contain 100 cubic inches,	L. 0 2 0	
Turning the same once over with water,	0 0 6	
Straw or sand for covering over the clay,	0 0 6	
		L. 0 3 0
Grinding and barrowing to the machine,	0 1 0	
Moulding by the machine per thousand,	0 2 0	
		0 3 0
Setting and unloading the kiln per thousand,	0 1 6	
Burning,	0 1 0	
Waste,	0 1 0	
		0 3 6
Cost of fuel per thousand, one ton of coals at 17s. 6d. per ton, calculated to burn 3500 tiles,	0 5 0	
		0 5 0
Expense in the yard per thousand,		L. 0 14 6

To which must be added rent, interest of money, and incidental expenses ; say 2s. 6d. per thousand, making 17s. per thousand, to which should be added L. 25 per cent. for manufacturer's profit, if the tiles are intended for sale.

When clay is of so mild a nature that it can be ground as it is raised, and in the neighbourhood of coal-works, the following deductions from the above estimate should be made, viz :—

In raising and grinding, per 1000,	L. 0 1 0
... straw,	0 0 6
... cost of fuel, from 1s. to 3s.,	0 3 0
	L. 0 4 6
Expense in the yard per thousand,	L. 0 10 0

Plate III. Fig. 1. Is an isometrical view of the different departments of a tile-work, in the order which is considered advantageous for carrying on the various processes. A is the position of the pug-mill and horse-walk ; B the drying sheds, in four lines, each 75 feet in length ; C the kiln, represented

as cut off at the springing of the arched roof; and D the hopper, also represented without the roof, in order to shew the mouths of the furnaces.

Fig. 2.—Ground plan of a kiln and hopper. A the kiln, and B the hopper. The walls and piers, *a*, for the furnace arches, are founded at the depth of about 5 feet under the level of the surface of the ground, and are carried up in solid brick-work, the whole length of the kiln, as from *a* to *b*, to the height of 2 feet 6 inches; see also Fig. 4. The overall dimensions of the kiln are 20 feet in length and 16 feet in width; and the height from the floor to the spring of the arch 12 feet, and it is capable of burning 30,000 tiles. The width of the ash-pits under the grate-bars is 14 inches, and of the furnaces above the grate-bars 2 feet. The height of the ash-pit 18 inches, and of the furnaces to the spring of the arches 12 inches, and the rise of the arch 15 inches, over which the floor of the kiln is laid. The walls above the level of the floor are carried up at a thickness of 2 feet 3 inches, and the depth of the arched roof is 9 inches; the number of chimneys with which it is perforated being 15, arranged in three rows. Kilns that are arched on the top must be built very strong, or there will be great danger of the arch falling. In the piers of the furnaces, the shaded parts represent the position of flues formed through the arches, to carry the flame through the openings in the floor; *cd*, *cd*, *cd*, are the grate bars. B is the hopper to contain the fuel, and to allow space for the fireman; its dimensions over all are 22 feet in length and 12 feet 6 inches in width; the neck of the furnaces projecting into it 2 feet.

Fig. 3. is a plan of the kiln taken above the level of the floor; *aa* the walls, *b* the door-way by which the kiln is loaded; and the interior represents the perforated floor, the shaded parts being the perforations or flues, having a width of 6 inches, crossed occasionally with a brick to bind the arches, the arches themselves being 9 inches in breadth. If

the sides of the kiln are curved, as shewn by the dotted lines *cc*, and embanked with clay on the outside, less thickness of wall will suffice; it will be equally strong, and will retain the heat better. This form of kiln can only be recommended for such as are covered with iron roofs and tiles.

Fig. 4. Is a transverse section of the kiln: *aa* the ground line, *b* the piers, *c* the ash-pits, *d* the furnace and grate-bars, *e* the walls, and *f* the door-way; the arched roof being in this figure also removed.

Fig. 5. Is a cross section of a drying-shed upon an enlarged scale, shewing the position of the shelving *a* in relation to the posts *b*.

Note on the subject of Tile-Kilns, by Mr Slight.

SEEING that a variety of opinions exists as to the construction of kilns for burning drain-tiles, it may not be unprofitable to offer a remark or two in connection with the foregoing papers. It will be seen that two of the writers approve of the plain floored kiln, while the third gives the preference to that description of kiln which is constructed with what is termed the *riddled* bottom, and the practice of this individual shews, that by using such a kiln he can produce an article at least as cheap as that produced from the others. It is well known, that in the east of Scotland the riddled kiln is in general preferred, and the circumstance of its capability of being worked by less experienced workmen, may have been a sufficient reason for its adoption. If such a reason for its adoption was conclusive when drain tile-works were few in number, it applies with greater force now, when such works are starting into existence in almost every parish, and when the difficulty of course, for a time, of getting *experienced* burners is proportionably increased.

Under this view of the subject, it is hoped that a short description of a riddled kiln, of the best construction commonly employed, may not be unwelcome. For those who are about

to engage in tile-making it will be at least satisfactory to have both methods laid before them. Without advocating, therefore, the one or the other upon comparative merits, further than having pointed at the greater facility of firing in the one case than in the other, the following description is submitted of an approved riddled-bottom kiln.

For the purpose of elucidation and reference, the following figures are given in Plate III. Fig. 6, is a horizontal section, of which the interior compartment A, taken immediately above the sole of the furnaces, shews a portion of all the furnaces *a*, and the commencement of the lateral flues, whereby the flame and heated air are allowed to spread in all directions. The compartment B shews the arrangement immediately over the furnace arches, wherein the work takes the form of spandril or dwarf-walls, of nine inches in thickness, with intermediate spaces of six inches in width, through which the bricks are laid at intervals. These walls cross the furnaces at right angles, and are perforated by each of them. The compartment C shews the form of the flooring of the kiln, which is all of brick, and perforated all over with openings of four to six inches wide, giving a free passage to the heated air from all the furnaces and lateral flues. *b* represents the flying buttresses broken off.

Fig. 7 is a transverse section of the kiln and wings, *a*, the body of the kiln, with section of a furnace and the riddle, *b b* the mouths of the furnace which pass quite through the kiln, *c c* the wings or fuel-vaults, with the arched flying buttresses, walls, and roof, enclosing the fuel-vaults, which, together with the firemen, are thus protected from the weather.

Fig. 8 an elevation and section taken longitudinally, the compartment A being the elevation, to shew the mouths of the furnaces, and B to shew the longitudinal section of the riddle and the position of the chimneys.

The general dimensions of this kiln should be as follows, the length 22 feet, breadth 10 feet 6 inches, and the height

to the crown of the arch 11 feet, all inside measure. The floor of the fuel-vaults should be 5 feet under the level of the kiln-floor. The sole of the furnaces 18 inches above the floor of vaults, and the height measuring from the sole to the soffit of the arch in the throat of the furnaces 1 foot 8 inches, the height of these within the area of the kiln being 2 feet 2 inches. Their width in the throat 1 foot 8 inches, and within, expanded to 2 feet 2 inches in width, the two extreme furnaces should be set off at 9 inches from the end walls. The side-walls ought to be not less in thickness than 3 feet to the height of 5 feet above the floor of the vaults, and above this they may be reduced to 2 feet 3 inches in thickness. The end-walls should be 3 feet in thickness throughout the whole height, besides having the support of the abutment-walls at the entrance and at the opposite end. The covering arch must not be less than 9 inches in depth, and the side-walls being afterwards raised to the height of 10 feet above the kiln-floor, the flanks of the arch are filled up with brick-work, and finished as a sloping roof. The covering arch and roof is perforated with twenty-six chimneys, each 6 inches square in the opening, placed in four rows, the chimneys in one row being placed opposite to the intervals in the adjoining row. In order to resist the thrust from within, four arched flying buttresses are thrown up against the side-walls of the kiln, the foundations of these should be 10 feet distant from the walls, and terminate at 2 feet 6 inches under the top of the walls. The dimensions of these buttresses may be 14 inches in width, and 18 inches in depth, with a radius of curvature of 14 feet for the intrados. As represented in Fig. 5, a wall is carried all round the kiln, to a height on the sides of 2 or 3 feet above the surface of the ground, while the end-walls may rise to a height suitable for the roof, and the whole external area *cc*, roofed in, leaving only two door-ways for the admission of fuel and air. The usual opening is left in one end of the kiln for the purpose of loading and drawing. The kiln may be built of either brick or stone, but if the latter, the walls

must be lined with brick to the thickness of 9 inches at least, and the arch turned with brick ; the furnaces require to be all built of fire-brick.

DESCRIPTION OF A MACHINE FOR MAKING DRAIN-TILES, BRICKS, &c. *Invented by the Most Honourable the Marquis of TWEEDDALE.*

THE machine which we have now to describe is one of high importance, not only as a novel and ingenious invention, but coming, as it does, to aid the agriculturist in a most important branch of the preparatory steps of his labours, and that too at the time when that branch has acquired a degree of importance hitherto unappreciated, a tile-making machine of such commanding powers as this seems to possess, is indeed a boon to this agricultural country ; and when its powers of extending the most approved system of draining have been fully developed, it will be a powerful engine in extending the productiveness of the soil. It is at all times a pleasure to admire the inventions of the ingenious ; it is more so when such inventions are devoted with success to general improvement ; and still more so, when to all these are added the circumstances of a man holding a high position in society, who, after having devoted a great portion of his life to the service of his country in arms, and when it became no longer necessary to wield those arms, has realised the beautiful metaphor, and beaten his sword into a ploughshare ; such may literally be said of the noble personage of whose invention we have to speak.

The tile-making machine of the Marquis of Tweeddale, as we have reason to know, has been the result of much patient investigation, and frequent experiment. These have at last been crowned with success ; and the fruit of his labours has been effectually secured to the inventor by letters-patent. The machine was first exhibited in public at the Highland and Agricultural Society's Show, held at Perth in October 1836,

when a working model was exhibited, which excited intense interest. Since then, the details have been still farther perfected, and the machines are now at work at Yester, the residence of the noble inventor, and at other tile-works.

In order to convey some ideas of the machinery, and the principles on which it operates in the formation of drain-tiles, the following description, with reference to the figures, is submitted; and these, in an abridged form, are all taken from the specification of the patent.

In Plate IV. the different views of the machine are exhibited, and in the different figures the corresponding parts are marked with the same letters of reference. Fig. 1. is a geometrical elevation or side-view of the entire machine. Fig. 2. a horizontal plan taken below the great lever, afterwards described. Fig. 3. a vertical section, taken longitudinally. Fig. 4. a transverse section, taken in front of the oblique or forming rollers *m*, shewing in detail those parts of the machine. This figure is on a smaller scale than the others, and must not be confounded with Fig. 1, by which it is embosomed.

In Figs. 1, 2, 3, the letter *a* points out the framing of cast-iron, supported on the truck-wheels *b*, upon which the whole machine can be moved in one direction; *c* and *d* are cylinders of cast-iron for compressing the clay to the proper breadth and thickness, and are turned in contrary directions by means of the toothed wheels *e* and *f*, of equal diameters, which receive their motion through the pinion *g*. The upper cylinder has a provision to slide to a small extent from the other, whereby they can be set to any thickness of tile. The clay, which is previously prepared and milled either in the common pug-mill or by plain rollers, is introduced by the hopper or feeding apparatus *h*, consisting of four or more rollers, turning on pivots, and around them is led the endless web, *i*, of mole-skin or other suitable substance, to convey the clay to the cylinders. To prevent adhesion of the clay to the cylinders, an endless web of like materials with that of the hopper, passes round the cylinders, and is distended over small rollers *j, j*,

Figs. 1 and 3, adjustable by screws for the purpose of keeping the distention perfect. The web of *clay* formed by passing the mass between the cylinders above described, has its edges squared off as it passes along by means of two vertical cutting wires. After passing these cutting wires, the clay is received on another endless web distended over the pulleys *k* and *l*; these being rounded on their periphery, as more distinctly seen at *l*, Figs. 2 and 4, give to the web of clay a degree of curvature approaching to that of a drain-tile; it is next passed between the forming rollers '*m, m*', Figs. 1, 2, 3, 4, where it takes the true shape. These last rollers revolve only from their contact with the clay web, now shaping into a continuous tile. In this state it is received upon the narrow endless leathern belts, *n, n*, stretched over the pulleys *o*, by which the clay is advanced to the cutting-off wire. The motions of the last described web, and that of the first bending-pulleys, is received from the wheels *e* and *f*, through the train of wheels and pinions *p*. In this stage of the process an *artificial hand* is introduced, which though extremely simple, performs its office in a very efficient manner. The appendage consists of a piece of wood, shaped like a horse-shoe, which is properly supported immediately above the tile; a piece of moleskin cloth is fastened to the sides of it, and the whole is so adapted as to press with more or less force on the back of the tile as may be required. A small cistern containing water is also provided, from which, at proper intervals, a single drop is allowed to fall on the back of the tile just before it passes under the cloth of this smoothing apparatus. The cloth being thus kept always moist and pliable, produces all the effect of the human hand in filling up and smoothing over any interstice that may have been formed in the bending of the tile. This, though not an essential part of the machinery, is found very beneficial in cases where the milling process is defective.

The cutting-off wire *g* consists of a frame moving in guides, and forming the lower end of a connecting rod *g'*, attached to the lever *r*, Fig. 1. In this frame the wire is stretched like

the string of a bow to flexible springs, to prevent its snapping. The lever receives motion from a wheel *s*, fixed on the shaft of the first mover, and is provided with a cog *t*, which acts once in a revolution on the lever, depressing the longer arm, and with it the cutting-wire, by which at each successive stroke a tile is cut off the advancing web. The cog *t* having passed the detent of the lever, the latter is instantly returned to its position by means of the weight *u*, appended to the shorter arm. During the short process of cutting-off, a cessation of motion takes place in the whole of the wheels beyond the pinion *g*, in consequence of its being deprived of three teeth in one part of its periphery. This temporary stop admits of the cutting-off wire doing its duty in an undisturbed manner, leaving the cut edges clean and fair. On the shaft of the first mover is also fixed a chain-wheel, adapted to receive the endless chain *v, v*, which also passes over a wheel *w*, on the opposite end of the axle of the pinion *g*, to give motion to the machine.

The tile, after being cut off, is received on another pair of endless leathern belts, which pass round the pulley *x*, and is distended over another pulley at the extremity of the alley of the drying-shed, and from which the assistants remove them on a tile-horse to the shelves. The capabilities of the machine are not, however, limited to these processes, for the inventor is at present completing an extension of its powers, whereby the tiles will be laid upon the shelves of the drying-shed by the machinery alone.

By means of a railroad extending the whole breadth of the sheds, the machine can be moved on the truck-wheels *b*, so as to be placed in the opening of each successive alley of the sheds in rotation, as they are filled with tiles. The main or first mover shaft also extends over a like breadth, and having a chain-wheel fixed opposite to each alley, it is only requisite to move the chain along with the machine.

Having thus described the process of making tiles by the

machine, it is unnecessary to go into the details of making soles. Suffice it to say, that by a very slight change the purpose is effected, while by other equally slight changes any form of drain-tile can be made.

By further slight modifications also, the machine is equally well adapted to the making of brick. The patent also embraces the making of plain and pan roofing tiles, all of which are produced of a very superior quality by the machinery.

In reference to the comparative expense of making drain-tiles by hand labour and by this machine, it may be stated, that a machine requiring equal to the power of one horse, and with the assistance of one man and two boys, one of these to feed in the clay and two to remove the tiles to the shelves, will make 12,000 tiles in a day of ten hours, it being understood that the clay is previously prepared and milled, as in the common way, when three or even four men can only produce 1500 tiles in the same time.

ON AN IMPROVED METHOD OF MAKING CLOVER-HAY.

By Mr JOHN PROUDFOOT, Inveresk.

[Hay-making is perhaps the worst conducted operation in Scottish husbandry, and the object of the Society in offering premiums for Essays on the best method of making both clover and meadow hay, is to urge the general adoption of a superior management in securing the crop of that valuable and nutritious winter provender. It is to be hoped that the success attained by the writers of the following essays will prompt other haymakers to adopt the practice described by them. A premium of Ten Sovereigns was awarded for this essay.]

THE present practice of making hay in the neighbourhood where I reside (and, I believe, it is much the same through-

out Scotland) is liable to many objections. The chief of these are, 1st, That of allowing the grass to be "too ripe," as it is generally called, before it is cut. 2d, Allowing the grass to be on the ground till it be either rotted with bad weather, drenched with rain, or dried up by too long exposure to the sun.

The method I have adopted for the last three years is very simple, but, in my opinion, a very secure one for our changeable climate. It is as follows:—This year (1836) I commenced cutting a field of grass of ten acres, on the 1st of July, just when the flower was going off the rye-grass, which I conceive to be the true criterion for cutting. This field was sown down with 12 lb. of the best Dutch red clover, and 1 lb. of white ditto, with $2\frac{1}{2}$ pecks of best Ayrshire annual rye-grass per imperial acre. It was a most excellent crop, and, as quick as five men could cut it down, women put it up close behind them in the following manner:—taking hold of the grass by the top, and placing it neatly round the left foot, keeping the foot *steady* in the heart of the handful, then tying a little band round the top, to keep it steady in the upright conical position, and when the foot is removed the aperture serves for a ventilator. Thus nearly all the surface of the grass is exposed to the air, and if the hollow cones are neatly put up, they will be almost safe from the weather, as, in case of rain, it runs off as fast as it falls.

If the weather is at all favourable the conical handfuls will be ready, in twenty-four hours, for turning out, and putting up into small cocks the same day; but they may, with greater safety, be allowed to remain in the first position until ready for putting up into large cocks. I am of opinion that the less turning clover-hay gets the better, as the oftener it is turned its value is deteriorated, more especially after getting rain.

One-half of the field was turned out of the handfuls, the other half allowed to remain until it was ready for being put into cocks, and my manner of making cocks is this:—A man stands at the cock, to whom the women bring the handfuls,

which he puts neatly up, always keeping the tops of them to the centre of the cock, in a direction sloping upwards from him, so as the slope may throw off the rain. In thus carefully constructing the cock, little vacuities will be left *between* the handfuls to act as ventilators, the influence of which will very soon render it proper to put the hay into larger cocks. In one week I had all the hay of the ten acres put into ricks of 130 or 140 stones, in which state I conceived it to be proof against *any* kind of weather,—indeed, were it not that purchasers were expected to take it “*off the rick,*” it might have been put into the stack. I may mention, that the rain fell less or more almost every day, excepting on Sunday the 3d, and Monday the 4th, but on the 5th there was a severe thunder-storm, *and, notwithstanding this most unpropitious weather, I made nearly 4000 stones of hay in the finest condition, in one week from the time it was cut; and as to its quality,* I think I am not too bold when I say, that I am not afraid to challenge the county of Edinburgh.*

The great advantage of this system over the common one in a bad season is, that *one* hour's sunshine will have more effect in drying the hay than a whole day; I have this year seen hay lying on the ground for weeks together, and the aftermath growing up through it, which is destructive both to the hay and the second crop; but if the system which I have described *be followed out*, I will venture to say that the hay will not only be infinitely superior, *but in the end will be put up at less expense* than in the old system, under the most favourable circumstances.

I have also converted the second crop into hay over the same ground with equal success, notwithstanding the bad weather, and all the obstacles incidental to making a second crop of good hay.

* Testimonials of the superior quality of the hay were furnished to the Society by the author, from Sir John Hope of Pinkie, and William Aitchison, Esq. younger of Drummorie.—Ed.

ON AN IMPROVED METHOD OF MAKING MEADOW-HAY. *By*
Mr JOHN IRVING, Farm-Overseer at Closeburn Hall,
Dumfries-shire.

[The Society's Silver Medal was awarded for this Essay.]

It is too much the prevailing opinion in Scotland, that meadow-hay cannot be secured there as effectually as it is in England. The cause of this prevalent opinion, it is apprehended, is the want of knowledge in the art of making meadow-hay. The usual practice of making every kind of hay in Scotland is, to allow the grass to stand too long before it is mowed, and in the case of meadow-hay until August, when the seeds of the grasses are nearly ripe, and the stalks have lost almost all their succulency ; and to allow the swath to lie for some days till a considerable part of its moisture is evaporated. The cut crop is then shaken out and turned over when it again lies for some days till it is thought sufficiently dry for putting into large cocks. The hay frequently remains in these cocks, in the field, for two or three months. It is then carried and made into a stack, when it is expected that no fermentation will take place, Scotch farmers imagining that fermentation in hay should always be avoided.

A method of making hay similar to that practised in England has been adopted by C. G. Stuart Menteath, Esq., of Closeburn, by whom I have been employed for some years past as farm-overseer. This method practised over an extent of water meadow, (chiefly consisting of peat-moss of 20 feet in depth, and upwards of 100 imperial acres in extent,) is to cut the grass as early in July as the weather will permit. The grass mowed in the morning before twelve o'clock, is carefully shaken out upon the ground by hand, and that mowed after twelve o'clock is allowed to remain in the swath till next morning, when it is likewise shaken out. If the weather is at all dry, the hay that has been shaken out is always put into small cocks for the night, so that the ground may be sooner dry the next morning to receive the hay for its exposure to the

sun; and after two dry sunny days' exposure, it is frequently, and always upon the third day, carried to the hay barn, where it undergoes a trifling fermentation, which is a desirable process when hay is made with its natural juices. If the weather prove rainy, the hay should remain in the small or hand cocks till a dry day allow of its being shaken out, and, in the evening, carried to the hay or Dutch barn. This barn is formed of larch poles, set upright, 15 or 18 feet in height, including a space of 15 feet in breadth and 60 in length, and supporting a light roof of thin boards, or a slight covering of straw stitched upon the rafters. No person who expects to have good meadow-hay should be without such a Dutch barn. Salt is generally sprinkled amongst the hay when it is packing up in the hay barn, in the proportion of about 16 lb. to the ton; and, should the hay have been exposed to much wet weather, a double quantity will be advisable. Hay has thus been made here, under my directions, for many years, without a single ton of it ever having been spoiled.

ON MAKING MEADOW-HAY. *By PATRICK MILLER, Esq.,
late of Dalswinton, Dumfries-shire.*

MAKING hay is universally allowed to be one of the most important branches of agricultural pursuits, but the principle on which it should be conducted is not at all understood on this side of Tweed.

In England, however, the operation is very differently performed, and with very different and more satisfactory results; for by their system, a great deal of time is saved at a critical period, and a far superior article of food for their animals is produced.

Besides the great and necessary dispatch which is used in England, much skill is also employed to produce and maintain a requisite degree of heat or fermentation in the stack when the hay is put up, in order to convert the juice of the herbage to a saccharine state, which is found to be both

more palatable, and likewise more nutritious for all bestial that is fed upon it.

In Scotland, on the other hand, it would almost seem as if diligence was employed to unnecessarily procrastinate the work, and subject it to the risk of unfavourable changes of the weather; and by the excessive bleaching and drying of the grass, which is so universally practised, it is deprived of the possibility of assuming the saccharine quality; and what sap is permitted to remain in it, is converted to starch, which is neither so agreeable nor nourishing for horses as hay made upon the principle which I am anxious to recommend, and from whence arises, as is easily to be perceived, a greater waste of hay in Scotch than in English stables.

Having premised this much, I proceed to detail the practice which I have pursued for many a bygone year on my farm, which, being on a limited scale, I shall therefore confine my description to the narrow compass of my own operations, but which, of course, easily admits of being extended to a larger field as circumstances may require.

When the hay season arrives and the weather is favourable, and when I perceive, by the height of the column of mercury in the barometer, and likewise from the appearance of the skies, that there is a likelihood of its continuing so, I set a couple of mowers to work very early in the morning, each attended by a boy or girl about twelve or thirteen years of age, and, as soon as the men have made half a dozen cuts of the scythe, the two boys or girls take up the swath and shake it out as thin as possible on the ground where it grew, there to lie and wither till after breakfast.

On the return of the mowers from their breakfast, a stout active woman begins to turn with a rake, *in the direction of the sun*, the grass which was first shaken out, the men and the boys cutting down and shaking out in the same way as in the morning.

When the woman has finished turning the early cut grass, she immediately goes to the spot where she began, and shakes

all out again as thin as she can, and when finished, she commences turning by large rakefulls where the mowers resumed their work after breakfast, and continues her task in the same manner as when she began in the morning, always turning as already said *in the direction of the sun*.

On the people returning to the field from their dinner, the two boys immediately begin to shake out that part of the second turned grass which had not been accomplished before going to dinner, and when that is finished, they commence turning what was last cut, and then shake it all out again.

At this period, the two mowers and the woman proceed to rake the first cut hay into what is called a wind-row, and one of the men commences with a pitchfork to put it into cocks of about 10 or 12 stones weight, and between 5 and 6 feet in height, *but on no account is a foot permitted to go upon it, for it cannot be put up too light*, neither is it to be roped, for if the weather is calm, a few hours after it is in the cock it will so compact itself, that it will require a very violent wind to overturn it.

Thus, the hay which was cut in the course of the day will be, through this mode of treatment, sufficiently dried and secured by the evening against any change of weather which may occur in the course of the night, and it will stand exposure to a storm fully as well as the hay which is so sadly mismanaged by the improper system at present in use.

So far the process only relates to getting quit of the redundant sap in the herbage, but if the hay gets rain or any adventitious moisture, either in working or stacking, it must be carefully dried off before being put into the stack, or so brisk a fermentation will ensue, that combustion will infallibly take place.

The next part of the operation is stacking the hay, and this may take place, if the weather continues fine, on the second or third day after the last cock was put up.

In making this kind of hay, the great and important object is to get it to ferment or heat in the stack, for the purpose of

making it evolve its saccharine quality, as in the malting of grain, and is effected as follows :

If a round stack is intended, let a common sack be well crammed full of hay or straw, and placed erect on the foundation where the stack is to be reared, and then begin building all around it with the first cut cocks, intermixing now and then a few of those last put up, in order to promote the fermentation ; and when the stack gets as high as the top of the bag, the worker pulls it straight upwards, and so continues working around and pulling it up till the stack is finished, and in this way a chimney is formed for the escape of the nascent gas.

Should a long stack be preferred, then a chimney must be brought out at the peak at each end, and one in the middle by the same means if a large mass of hay is put in the stack ; and, in conclusion, I recommend that these vents shall not be closed for a month, or while any perceptible fermentation is going on.

EXPERIMENT IN FEEDING CATTLE ON DIFFERENT DESCRIPTIONS OF FOOD. *By Mr ROBERT STEPHENSON, Whitelaw, Haddington.*

THE cattle selected for this experiment were oxen rising two years old, and bred on the same farm. Their live-weights were ascertained at the beginning, during different periods, and at the end of the experiment. They were divided into three lots of six beasts each, and placed in open courts with sufficient sheds and stalls, and small mangers fitted up for corn and linseed cake. A correct account was kept of the weight of food consumed by each lot. Lot 1st were allowed linseed cake, bruised beans, and bruised oats, in addition to what turnips they could consume ; and for the last twenty-four days of the experiment 20 lb. of potatoes per day were given to each beast. Lot 2d received the same allowance with the exception of linseed-cake, and for the last twenty-four days

they got only 10 lb. of potatoes each beast per day. And the 3d lot were fed on turnips alone. None of the lots were allowed hay. The objects of this experiment are, first, To compare cattle fed partly on linseed-cake with those which had none; secondly, To compare those fed partly on corn with those which had none; and, thirdly, To compare those fed solely on turnips with those which had different sorts of food. From former trials we are inclined to believe that cattle consume food in proportion to their weights when nearly alike in condition. We therefore resolved in this experiment to divide the eighteen cattle, so as to confirm or refute this belief. They had been all kept in the same manner since they were calved, and were pretty much alike in condition, although varying considerably in weight. The six heaviest cattle weighing in live-weight 486 imperial stones were selected for lot first; the next six heaviest of 443 stones constituted lot second; and the six lightest made lot third, were $346\frac{1}{4}$ stones. These weights were ascertained on the 23d November 1834, when the experiments began after the cattle had been in the court-yard from 20th September 1834, and all fed on the same kind of food, namely, common white globe turnips. The white turnips given during the experiment were of good quality, raised with dung upon a rather stiff soil, and estimated about 20 tons per acre, their gravity on the 19th November 1834 being 897.4 oz. per cubic foot. The Swedish turnip were also of good quality, grown on good clayey loam, 20 tons per acre by weight and measurement, their gravity being 1030 oz. per cubic foot on 19th November; but they had lost weight for bulk considerably by the 17th March following, when the last were raised from the ground, being then only 976.9 oz. per cubic foot. The white turnips used before the experiment commenced on 23d November 1834, were raised with bone manure, and rather inferior in quality, being only on 19th November 774 oz. per cubic foot. With these preliminary observations, we will proceed to state the particulars of the experiment.

1. Food consumed by each beast of lot 1st,—

13 cwt 1 qr. 16 lb. white turnips from 23d November to 3d December 1834, ten days, being 150 lb. per day at 3d. per cwt.	L.0	3	4
30 lb. bruised beans, for 10 days, being 3 lb. per day at 13s. per boll, allowing 60 lb. to the bushel,	0	1	7½
40 lb. linseed-cake, for 10 days, being 4 lb. per day at ¾d. per lb. or L. 7 per ton,	0	2	6
25 cwt. 3 qr. 20 lb. Swedish turnips, from 3d December to 25th December 1834, 22 days, being 132 lb. per day, at 4d. per cwt.	0	3	7½
88 lb. linseed cake, for 22 days, 4 lb. per day at ¾d. per lb.	0	5	6
66 lb. bruised beans, for 22 days, being 3d. per day,	0	3	7
69 cwt. 0 qrs. 21 lb. Swedish turnips, being 123 lb. per day for 63 days, from 25th December 1834 to 26th February 1835,	1	3	0½
189 lb. bruised beans, for 63 days, being 3 lb. per day,	0	10	2½
126 lb. bruised oats, for 63 days, being 2 lb. per day, at 20s per qr. say 42 lb. per bushel,	0	7	6
189 lb. linseed cake, for 63 days, being 3 lb.* per day,	0	11	9½
21 cwt. 2 qrs. 2 lb. Swedish turnips, being 100 lb. per day, from 26th February to 22d March, 24 days,	0	7	2
480 lb. potatoes, for 24 days, being 20 lb. per day, at 6s. per boll of 4 cwt.	0	6	5
72 lb. bruised beans, for 24 days, being 3 lb. per day,	0	3	10½
48 lb. oats, for 24 days, being 2 lb. per day,	0	2	10½
72 lb. linseed cake. for 24 days, being 3 lb. per day,	0	4	6
Total cost of feeding one beast of Lot 1st,	L.5	2	7

2. Food consumed by each beast of lot 2d,—

14 cwt. 1 qr. 24 lb. turnips, being 162 lb. per day for 10 days, at 3d. per cwt.	L.0	3	7½
30 lb. bruised beans, for 10 days, being 3 lb. per day	0	1	7½
29 cwt. 1 qr. 24 lb. Swedish turnips, being 150 lb. per day for 22 days, at 4d. per cwt.	0	9	9½
66 lb. bruised beans, for 22 days, being 3 lb. per day,	0	3	7
67 cwt. 2 qrs. Swedish turnips, being 120 lb. per day for 63 days,	1	2	6
Carry forward,	L.2	L.	1½

* It will be observed that the linseed cake has been reduced from 4 lb. to 3 lb. per day, because the cattle, on being allowed oats in addition to the beans, would not eat more than 3 lb. of linseed cake per day.

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	Brought forward	L. 2 1 1½
189 lb. bruised beans, for 63 days, being 3 lb. per day,	0 10 2½	
126 lb. oats, for 63 days, being 2 lb. per day,	0 7 6	
24 cwt. 2 qrs. 16 lb. Swedish turnips, being 115 lb. per day for 24 days,	0 8 2½	
240 lb. potatoes, for 24 days, being 10 lb. per day,	0 3 2½	
72 lb. bruised beans, for 24 days, being 3 lb. per day,	0 3 10½	
48 lb. oats, for 24 days, being 2 lb. per day,	0 2 10½	
Total cost of feeding one beast of Lot 2d,	L. 3 17 0	

3. Food consumed by each beast of lot 3d,—

11 cwt. 3 qrs. 14 lb. white turnips, being 113 lb. per day for 10 days, at 3d. per cwt.	L. 0 2 11½
22 cwt. 2 qrs. 10 lb. Swedish turnips, being 115 lb. per day for 22 days, at 4d. per cwt.	0 7 6½
64 cwt. 2 qrs. 21 lb. Swedish turnips, being 115 lb. per day for 63 days,	1 1 6½
19 cwt. 2 qrs. 24 lb. Swedish turnips, being 92 lb. per day for 24 days,	0 6 6½
Total cost of feeding one beast of Lot 3d,	L. 1 18 7½

Abstract of Cost of Keep.

Lot 1st, 119 days, L. 5 2 7 =	6.0343 shillings per week.
... 2d, L. 3 17 0 =	4.5294
.. 3d, L. 1 18 7½ =	2.2712

Improvements in Live Weight.

	LOT FIRST.		LOT SECOND.		LOT THIRD.	
	Live Weight, in stones.	Improvement, in stones.	Live Weight, in stones.	Improvement, in stones.	Live Weight, in stones.	Improvement, in stones.
Nov. 23. 1834,	486	...	443	...	346½	...
Dec. 25. ...	520	34	469	26	354½	8
Jan. 24. 1835,	554	34	499½	30½	375	20½
Feb. 25. ...	562	28	528	28½	389	14
Mar. 23. ...	594	12	544	16	395½	6½
Total improvement in seventeen weeks, . }		108		101		49

We have thus obtained data on which we can ascertain whether the foregoing methods of feeding of cattle can be practised without loss.

We regret that we are unable to present the amount of the beef, tallow, and hides, of all the cattle in this experiment when killed, having only obtained a correct return of four of them, which were slaughtered by Mr M. Hutchison, Leith. But as we have ascertained pretty accurately the dead-weight of cattle, from a number of experiments on those of like condition and age, by multiplying the live-weight by the decimal .571, we shall apply this rule to the live weights in the above Table, in order to ascertain the quantity, and estimate the value, of the beef produced; and we shall add 6d. per stone to the beef, being its increased value by feeding at the end of the experiment. The tallow is about $\frac{1}{10}$ of the live-weight, or that multiplied by .08 will give the nett weight of the tallow. The hide is about $\frac{1}{20}$ part of the live-weight, or that multiplied by .05 will give the nett weight of the hide; and the live-weight multiplied by .28, will give the weight of the entrails and refuse.

Lot 1st, subjected to these rules, stands thus:—Improvement in live weight, 108 stones, = 61 st. 10 lb. beef, at 6s. per st.	L.18 10 3½
Increased value of the carcass of 339 st., at 6d. per st.	8 9 6
	<hr/>
Increase of value from feeding,	L.26 19 9½
Deduct cost of keep of each beast, L.5 : 2 : 7 × 6,	30 15 6
	<hr/>
Loss on feeding Lot 1st,	L.3 15 3½
Being L.12 : 6 : 0½ per cent.	

Lot 2d,—Improvement of live weight, 101 stones, = 57 st. 10 lb. beef, at 6s. per st.	L.17 6 3½
Increased value of carcass of 310 st., at 6d. per st.	7 15 0
	<hr/>
Increase of value from feeding,	L.25 1 3½
Deduct cost of keep of each beast, L.3, 17s. × 6,	23 2 0
	<hr/>
Profit on feeding Lot 2d,	L.1 19 3½
Being L.8 : 10 : 1 per cent.	

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Lot 3d,—Improvement of live weight, $40\frac{1}{2}$ stones, = 28 st. 4 lb. beef	
at 6s. per st.	L 8 9 8 $\frac{1}{2}$
Increased value of carcass of 226 st., at 6d. per stone,	5 13 0
	<hr/>
Increase of value from feeding,	L 14 2 8 $\frac{1}{2}$
Deduct cost of keep of each beast, L. 1 : 18 : 7 $\frac{1}{2}$ \times 6,	11 11 7 $\frac{1}{2}$
	<hr/>
Profit on feeding of Lot 3d, .	L 2 11 1
Being L. 22 : 1 : 1 per cent.	

Thus, when turnips alone were used, a profit of 22 per cent. was realized; when corn was used along with turnips, the profit was diminished to 8 $\frac{1}{2}$ per cent.; but when still more expensive food was used, that is, corn and linseed cake, along with turnips and potatoes, a loss was sustained of no less than 12 $\frac{1}{10}$ per cent.

Two pairs of the above cattle were selected and exhibited at the Local Show in this county, and gained the first prizes as the best beasts bred in the county. One pair belonged to Lot 1st, and the other pair had one beast from Lot 1st, and another from Lot 2d. They were sold on the ground for L. 20 a-piece. Their live and dead weights were respectively as follows:—No. 1, Live weight 112 stones; dead weight of beef, 66 st. 2 lb.; tallow, 8 st. 10 lb.; hide, 5 st. 11 lb.; other offals, 32 st. 5 lb. No. 2 (from Lot 2d), Live weight, 100 stones; dead weight of beef, 58 st. 6 lb.; tallow, 7 st. 7 lb.; hide, 4 st. 12 lb.; other offals, 29 st. 3 lb. No. 3, Live weight 103 stones; dead weight of beef, 62 st. 3 lb.; tallow, 9 st.; hide, 4 st. 12 lb.; other offals, 26 st. 13 lb. No. 4, Live weight 109 stones; dead weight of beef 62 st. 4 lb.; tallow, 9 st. 4 lb.; hide, 5 st. 12 lb.; other offals, 31 st. 8 lb.

We shall give another view of the subject by estimating the cost of producing a lb. of live-weight.

Lot 1st cost 4.884 pence for every lb. of increased live weight.		
Lot 2d — 3.92	do.	do.
Lot 3d — 4.39	do.	do.

We are not aware that any one has hitherto attempted to assign the separate agency of each kind of food in the production of live-weight, when more kinds than one are employed

in the feeding of cattle. Could this be done in a satisfactory manner, the question would at once be set at rest—Which food was the most profitable? We have already stated the cost of producing 1 lb. of live-weight in each of the three lots of cattle in this experiment, where it appears that the joint agency of turnips and corn is the cheapest of the three. But we are not prepared to say that the like result will be uniformly obtained, because, although observing the improvement in live-weight of a considerable number of cattle on a given quantity of turnips to be, on an average, an increase of 1 lb. of live-weight for every 90 lb. of turnips, under good management, and with good cattle, yet we have seen cattle which did not improve 1 lb. of live-weight for every 1000 lb. of turnips. By this experiment lot 3d only increased a lb. of live-weight for every 116 lb. of turnips; and it will be observed, from what cause we know not, that for the first thirty-two days of this experiment, this lot increased only 8 stones. Now, for forty-six days immediately preceding 23d November 1834, the beginning of the experiment, these same six cattle increased $48\frac{1}{2}$ stones, or 113 lb. each beast; while, from a trial made for eight days, from 7th till 14th November inclusive, they consumed 160.85 lb. each per day of common turnips (white globe), which gave only 65.47 lb. of turnips to a lb. of increased live weight. But, avoiding lengthened details of other experiments, we will assume 90 lb. of turnips, as being equal to the production of 1 lb. of increased live-weight, and from this datum endeavour to ascertain the agency of each different kind of food employed in the feeding of Lots 1st and 2d. We shall begin with Lot 2d, and divide $6 \times 15,226$, the quantity of turnips consumed by this lot, by 90, and the quotient is 1015 lb. of live-weight, as having been produced from the agency of turnips. Lot 2d, also, consumed 1440 lb. potatoes. We say that 40 lb. of potatoes will yield 1 lb. of increased live-weight, the result will therefore be $1440 \div 40 = 36$ lb. of live-weight as having been produced from the agency of potatoes; therefore $1015 + 36 = 1051$, and the remainder,

363 lb. as having been produced by the agency of corn, which make up 1414 lb. the total increase of live-weight.

Lot 1st, by the same rule, stands thus :—

$14,563 \times 6 = 87,378 \div 90 = 970$ lb. of live weight by the agency of turnips.

$480 \times 6 = 2880 \div 40 = 72$ lb. do. do. potatoes.

$531 \times 6 = 3186 \div 8.77 = 363$ lb. do. do. corn

$389 \times 6 = 2334 \div 21.81 = 107$ lb. do. linseed-cake.

The cost of producing a pound of increased live-weight by the above data is,—

90 lb. of turnips at 4d. per cwt. = 3.2142 pence.

40 lb. of potatoes at 1s. 6d. do. = 6.4285 do.

8.77 lb. of corn at 3s. 3d. per bush. of 60 lb. = 5.7 do

21.81 lb. of linseed-cake at $\frac{3}{4}$ d. per lb. = 16.3575 do.

Although we have assumed, in the above calculations, that 40 lb. of potatoes are equal to 90 lb. of turnips in the production of live-weight, we are far from believing that proportion correct in point of fact. On the contrary, we should say, that 90 lb. of turnips are fully equal to 70 lb. of potatoes, and that the latter is perhaps the most expensive food usually given to cattle; and certainly, so long as potatoes fetch 1s. 6d. per cwt. in the market, cattle on that food will soon, to use a familiar phrase, “eat off their own heads.” When any other food than turnips is desired for feeding cattle, we would recommend bruised beans, as being the most efficient and least expensive; on this account we would prefer bruised beans alone to distillery offal. As regards linseed-cake, or even potatoes, they are not to be compared to beans. In confirmation of this opinion, we may be permitted to state shortly the improvement made by three cattle last season, 1835–6, of the same age and sort, indeed own brothers, to three of the cattle in Lot 1st of our experiment. They were fed on white turnips until 27th January, and after that date on Swedish; and, as we meant then to compete for the prize given for the *best beasts* bred in the county, we allowed them from 10th December $3\frac{1}{4}$ lb. of oats and beans, and $3\frac{1}{2}$ lb. of hay each per

day. And, in order that a comparison may be made with lot 1st of our experiment, we will state the improvement in live-weight as near the same period as the dates of weighing will admit. The live-weight of the three cattle on the 25th November was 273 stones, and on the 31st March 338 stones, being an increase of 65 stones or $21\frac{2}{3}$ stones each in 127 days; while by our experiment, Lot 1st, in 119 days gained only 18 stones each, being a difference of $3\frac{2}{3}$ stones in favour of last season. A pair this season also gained the prize, as the best beasts bred in the county, against others which had been fed on as much linseed-cake as they could eat. Our pair of two years' old were sold, 16th May 1836, for L. 55, 10s. We were at very great pains in the keeping of our two year old cattle this season, having cut all the turnips for them, white as well as Swedish. We have always been in the habit of cutting the Swedish turnips, but never till this season did we cut the white also. In conclusion on this part of our subject, we give it as our opinion, that whoever feeds cattle on *turnips alone* will have no reason, on the score of profit, to regret their not having employed more expensive auxiliaries to hasten the fattening process. This opinion has not been rashly adopted, but has been confirmed by a more extended and varied experience in the feeding of cattle than has fallen to the lot of most men.

That cattle consume food something nearly in proportion to their weights, we have very little doubt, provided they have previously been fed in the same manner, and are nearly alike in condition. Age, sex, and kind, have little influence in this respect, as the quantity of food consumed depends much on the length of time the beast has been fed, and on the degree of maturity at which the animal has arrived,—hence the great difficulty of selecting cattle fit for experimenting upon. To explain our meaning by an example, we would say that two cattle of the same weight, and which had been previously kept for a considerable time on similar food, would consume about the same quantity. But, on the contrary, should two

beasts of the same weights be taken, the one fat and the other lean, the lean beast would eat twice or perhaps thrice as many turnips as the fat one,—more especially, if the fat one had been for some time previously fed on the same food, as cattle eat gradually less food until they arrive at maturity, when they become stationary in their appetite. We have had great experience in feeding stock, and have conducted numbers of experiments on that subject with all possible care, both in weighing the cattle alive, and the whole food administered to them, and in every experiment we made we discovered something new. But we have seen enough to convince us that were the art of feeding better understood, a great deal more beef and mutton might be produced from the same quantity of food than is generally done.

We had on turnips, at the time we were conducting the foregoing experiments, 5 queys of the same age and sort as the 18 stots, also 20 three-year old stots, such as are bred on the Perthshire braes, in one court, and 14 Fife stots in another court. Five of an average size and weight from each of the lots of Perthshire and Fife stots were selected, and their live-weights ascertained, and the turnips consumed by them weighed. They were weighed on 25th December, and the quantities of turnips consumed were ascertained from an average of the weeks previous and subsequent to that day. The result was as follows:—For every stone they were of live-weight, the cattle consumed of Swedish turnips each day, The Perthshire stots 1.861 lb.; the Fife ditto 1.781 lb.; the two-year old queys 1.8881 lb.; Lot 3d of our experiment fed on turnips alone, 1.948 lb.; Lot 2d of our experiment, assuming the value of the food other than turnip, as stated in the previous part of this paper, £3; Lot 1st of our experiment, under the same condition as Lot 2d, 2.07. We must not be understood as presenting the above ratio of weight of beasts to weight of turnips as uniform. On the contrary, the ratio varies according to condition and food; we took the ratio at the end of December as a medium period. These same cattle,

in the beginning of November previous, when on common white turnips, consumed them in the following ratio:—The Perthshire stots 2.7 lb.; the Fife stots 2.61. Lot 1st of our experiment when on turnips alone, before the experiment, 2.28; Lot 2d under the same conditions, 2.8; and Lot 3d under the same conditions 2.772. No note was taken of the white turnips consumed by the queys. It is not uncommon for a lean beast to consume more than a fourth part of his own weight of food every day, while a very fat one will not consume one-tenth. We kept two of the cattle of Lot 3d until the end of December 1835, when their live-weights were increased to nearly double, and they then only consumed 1.5 lb. of turnips for each stone of live-weight.

We shall conclude by relating a singular fact, which is in some degree connected with this subject: sheep on turnips will consume nearly in proportion to cattle, weight for weight, that is, 10 sheep, 14 lb. per quarter, will eat nearly the same quantity of turnips as an ox of 40 stones; but turn the ox to grass, and six sheep will be found to consume an equal quantity. This great difference may perhaps be accounted for by the practice of sheep cropping the grass much closer and oftener than cattle, and which of course prevents its growing so rapidly with them as with cattle.

[Mr Stephenson, of date 22d May 1837. writes thus:—"In the last Number of the Transactions, I observe from Mr Boswell's Report on Feeding Cattle, a remarkable coincidence of what is stated by me. Mr Boswell has given the live-weight of his cattle, and the quantity of food consumed by them, and from these you will find the following results. In the cattle at Kingcausie, 94.841 lb. of yellow turnip produced 1 lb. of increased live-weight in the hemmels, and 126.204 lb. in the byres; and every stone of live-weight consumed 1 411 lb of turnips in hemmels, and 1.383 lb. in byres. In the cattle at Balmuto, 96 lb. of turnips and potatoes produced 1 lb. of increased live-weight in the hemmels, and 112.678 lb. in the byres. And every stone of live-weight consumed 1.325 lb. of turnips in the hemmels, and 1.262 lb. in the byres. These results arise from taking the average weight of cattle at the middle date, and the average weight of turnips consumed each day."—Ed.]

EXPLANATION OF THE STEAM-PILOUGH INVENTED BY JOHN HEATHCOAT, ESQ., M. P. ; AND AN ACCOUNT OF THE TRIAL LATELY MADE WITH IT ON MOSS LAND IN PRESENCE OF A DEPUTATION FROM THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

MUCH interest has been awakened in regard to the applicability of steam to agricultural purposes, and various attempts have been made to invent engines which should, by means of this agent, perform the ordinary operations of ploughing and harrowing.

One of the machines intended to accomplish this object, has been invented by Mr Heathcoat, M. P. for Tiverton ; and he obtained a patent for it in 1832. The particular use to which he has, in the first instance, applied it, is the reclamation of *Bogs* or *Mosses*, which, of all descriptions of soils, offer perhaps the greatest natural obstacles to improvement by mechanical means.

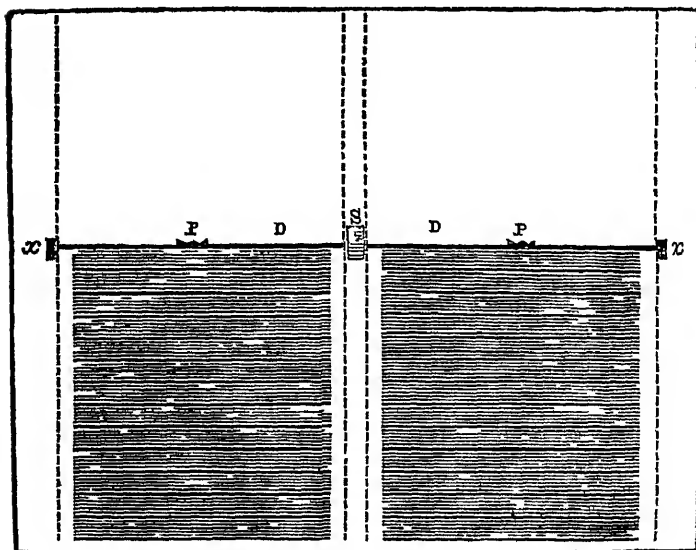
Mr Heathcoat's machine appears to have effectually overcome all these obstacles. Such at least is the result of the experiments hitherto made with it. A very important trial took place on the 20th of April last, on a bog or moss in Lancashire, called the *Red Moss*, near Bolton-le-Moors, in presence of a deputation of the Highland and Agricultural Society of Scotland, which was attended with complete success. It having been publicly known for some time previously that this trial was to take place, all interested in the subject had an opportunity of witnessing it. The Deputation from the Society consisted of the Marquis of Tweeddale, Vice-President, and several other members well qualified, in every way, for judging of the fitness of the machine for fulfilling its intended purposes ; and it is understood that they will give to the Society a report very favourable to Mr Heathcoat's invention. Meanwhile, some description may be given of the machine, and its mode

of operation, founded chiefly upon the information supplied at the time of the experiment to the Secretary, by Mr Parkes, the very intelligent practical engineer employed by Mr Heathcoat in its construction and management.

The machinery employed to act upon the plough is of too complex a nature to admit of very detailed figures in this place; but in order to convey some idea of its general appearance, the accompanying cuts are given, from which a notion of the form and arrangement of its principal parts may be conceived.

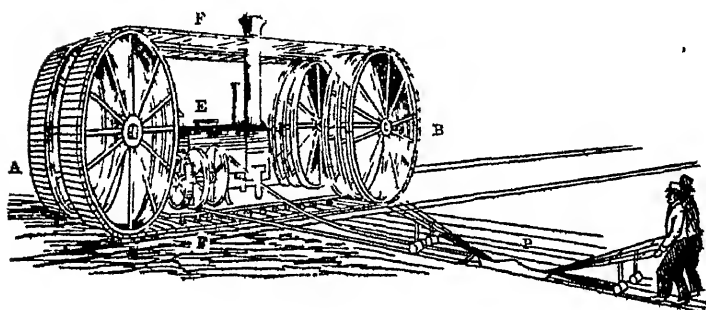
The cut No. 1. is to be considered as a plan of a field partly ploughed, in which the different parts of the apparatus are represented in their relative positions, though not in their true proportions. S is the principal machine, P P the ploughs, and *xx* the auxiliary carriages. The double lines DD, extending from S to *x*, and passing through P, being flat iron bands, afterwards described, by which the plough is drawn.

No. 1.



The cut No. 2. is a sketch in perspective,* done chiefly from recollection, of the principal machine, including the steam-engine, occupying the left side of the cut, and of the plough, which is seen to the right

No. 2.



The apparatus, it will be seen, embraces three distinct parts; 1st, The steam-engine and machinery connected with it, forming of itself a complete locomotive system.

2d, The auxiliary carriage placed, when circumstances will permit, at the distance of 220 yards on either side of the principal machine.

And 3d, The plough, which traverses between the other two. In situations sufficiently extensive to admit of a reach of furrow on both sides of the principal machine, an auxiliary and plough are employed on each side, as denoted by their positions in No. 1.

The cut No. 2. exhibits a very imperfect outline of the principal machine, the parts seen being chiefly those that form the medium of locomotion. They consist of two pairs of skeleton drums, one placed at each end of the apparatus. These

* In order to prevent confusion in this figure, the arms in the outer wheels only of the drums are represented, and the greater part of the gearing is also left out.

pairs of drums are about 26 feet apart ; they are formed individually by the combination of three wheels of equal diameter, placed parallel to each other, and connected by a common axle : they are nine or ten feet in diameter. These four drums stand towards each other somewhat in the relation of the four wheels of a large waggon. The two drums on each side of the machine, being one of each pair, are embraced by a great endless band of about $7\frac{1}{2}$ feet in breadth, formed of planks laid transversely, and held in connection by several flexible iron-hoops applied to the interior surface of the planks, and to these lines of hoop the planks are individually fixed by bolts, thus forming bands sufficiently flexible to apply round the periphery of the drums.

In the cut No. 2, A B points out the drums, and F F the bands, leaving an open space between their inward edges of six or seven feet all round the apparatus, so that the distance between the extreme edges of the two bands extends to about twenty-one feet. To keep the drums at the proper distance, and so prevent the collapsing of the bands, their axles are supported in the extremities of a strong framework or platform, which again is supported through the medium of numerous small wheels or friction rollers upon the lower part of the great bands. These wheels are arranged in rows so placed as to fall upon the lines of hoop while at the same time they turn upon axles fixed to the platform, and thus afford an easy smooth motion to the platform, even when loaded with all its machinery. The great bands thus form a perfectly portable and smooth road for the platform ; and suppose the locomotive parts of the machine put in motion at whatever rate, the continually successive parts of the bands lay themselves down under and before the foremost drums, while the bands having a broad bearing on the surface of the moss, give perfect stability to the whole.

To complete this system of locomotion, the steam-engine E with all its machinery is placed on the platform already at-

luded to ; the engine is constructed on the same principles as those employed on railways, differing only in the speed given to the medium through which its locomotion is conveyed. In the present case the motion is reduced by a combination of gearing branching off to each side of the engine, and ending in a large spur-wheel fixed on the axle of each of the drums situate towards the left of the figure in No. 1. Another branch of gearing is led off to each side of the engine, to give motion to the pulleys on which the band that draws the plough is spirally coiled.

2d, The auxiliary part of the machinery is a carriage, not seen in the cut No. 2, but represented by *xx* in No. 1, one being placed on each side of the field, mounted on four wheels, and furnished with the requisite gearing, by which a man can move it forward. It is also furnished with a large plain pulley placed horizontally, round which the flat iron band passes, proceeding from, and returning to the principal machine, whence it derives its motion through the second branch of gearing already alluded to, and to this band the plough is attached. Each of the auxiliaries in its progressive state moves upon two lines of planks ; the one line is laid into a shallow trench cut in the moss, the other is simply laid on the surface ; the former being for the purpose of resisting the draft of the plough. Three lengths of plank in each line are all that are necessary, the one behind being brought up and laid in before the others in regular succession, as the work proceeds.

3d, The plough has but a distant resemblance to that in common use : it is double, that is to say, has two sets of sills, one set at each end, and each set consists of four handles, it being occasionally found necessary to employ two men to guide the plough. It has also two shares, coulter, and mould-boards, together with all the peculiar apparatus applied to this plough ; but it may be said to have no beam. The mould-boards are both on one side, set tail to tail, so that the plough

acts to and from the machine without turning round. This plough is most ingeniously constructed for performing the various functions required of it. By means of friction rollers placed under each end, and which give motion to a crank, (simply by the contact of the rollers with the ground), two sets of apparatus are put in motion that perform essential offices in the operation of ploughing moss. These are, first, a peculiar action given to a sharp-edged and crooked blade which is made to traverse against the sharp steeled edge of the coulter, producing the operation of *clipping*, which effectually severs all the roots of the Heaths, Carices, and other strong-rooted plants that occur in the line of the cut made by the coulter. Secondly, a similar operation is simultaneously performed, and by the same impulse, with another set of similar instruments acting under and against the edge of what forms the *share* of the plough; these last separate all the fibrous roots that occur in the sole of the furrow. The form of the mould-boards is such as to turn the furrow-slice completely over, and lay it neatly with the heath surface downwards.

The auxiliary carriages move on lines parallel to the roadway of the principal machine, one being placed on each side, as at *xx*, cut No. 1, and at the proposed distance of 220 yards from the machine. The bands D, each of 660 yards in length, pass out from each side of the principal machine, where the ends are secured to one of the machine pulleys on the respective sides, extend to and pass round the large pulley of the auxiliary, and return again to the machine. At this point the plough is affixed to the band, while as much more of the band is coiled round the other machine pulley respectively, as is equal in length to the distance between the machine and the auxiliaries. The steam-engine being now set on, and the second branch of gearing adjusted to act upon the pulley to which the first end of the band is attached, this pulley will coil up the band, causing the plough to advance towards the auxiliary, and at the same time the other pulley,

which at this time is free to uncoil, will deliver off its portion of the band. When the plough has reached the auxiliary, the motion is stopt, the plough is set to the next furrow, the action of the steam-engine on the pulleys is changed by shifting a clutch from the one to the other, and the pulleys reverse their duty, that which was uncoiling now becoming the coiler, and so on, alternately.

Having thus attempted to give some idea of the construction of the machine, a few observations may be added in reference to the mode of working and the economy of its management. On this subject Mr Heathcoat's printed description supplies the following quotations—"In commencing the reclamation of a bog, a roadway is first to be traced out in a suitable direction for the proposed operations. This is done by simply forming two drains parallel to each other and about seven yards apart. The principal machine is launched on this roadway (still retaining its natural surface). The machine rests on the raw bog, and bears on so large a surface, that its buoyancy is insured. It also consolidates and dries the roadway by its pressure."

"The machine and auxiliaries remain stationary during the time occupied by the ploughs in taking one furrow; they are then severally put in motion, and made to advance in three parallel lines, in order to keep pace with the breadth of land turned over, and to pull the ploughs accurately straight. The machine is impelled by the engines, and each auxiliary by its attendant man, who also shifts his planks onward as occasion requires. The machine and its auxiliaries have thus to be moved over a space of 18 inches only, whilst the ploughs have each travelled 220 yards, and turned over 220 square yards of land 9 inches in depth; in other words, the machine and auxiliaries have only to be moved 11 yards, in the time that the ploughs have travelled five and a half miles, and turned over a statute acre of land. The ploughs perform their work at the rate of two miles an hour, and are subject to very few

stoppages; so that eight acres and three quarters nearly of bog would be ploughed up in a day's work of twelve hours—or, taking the average of day-light throughout the year, and making a liberal allowance for hinderances from weather and other causes, one machine would plough up 2000 acres in a twelvemonth.”

The principal machine, together with a 6 ton load of fuel, weighs about 30 tons, its superficial bearing on the moss is 390 square feet, giving a pressure of 178 lb. on each square foot. Taking the weight of a man at 168 lb., and the area of his foot at 30 square inches, he would, in walking, press with a weight at the rate of 806 lb. per square foot, so that the machine has a buoyancy of about $4\frac{1}{2}$ times that of a man, and could therefore travel on much softer soil than Red Moss, which is considered very wet and spongy.

The steam-engines of the machine consist of two cylinders, each of 10 inches diameter, with a two-foot stroke, and the other appurtenances of a non-condensing engine, together with a fly-wheel, and at a regular speed make sixty strokes per minute. The machine is capable of travelling 1 inch for every stroke of the engine, or 5 feet per minute. This velocity is acquired with a pressure of steam equal to four pounds on the inch. The drain on either side of the roadway supplies abundance of water for the boiler.

The flat iron band by which the plough is dragged is $2\frac{1}{2}$ inch broad, and $\frac{1}{8}$ inch in thickness.

The friction of the band, together with the empty plough at the distance of 304 yards, is overcome with a pressure of steam equal to 8 lb. on the inch, and, when the plough has hold of the furrow slice, a pressure of 13 lb. is required, making in all 17 lb. pressure of steam on the piston * of the engine, which, after deduction of 2 lb. for the friction arising from the piston itself, leaves a total effective pressure equal to fifteen horses' power.

* These measures of the steam are supposed to be the excess of pressure above that of the atmosphere.

This force is required to work one plough moving at the rate of two miles per hour, turning over a furrow slice of 18 inches in breadth, by 9 inches in depth. If two ploughs were employed, the force would require to be increased to a pressure of 25 lb. on the inch, equivalent to 25 horses' power, and the plough would turn over a surface of $8\frac{1}{4}$ imperial acres in twelve hours.

The plough weighs $12\frac{1}{2}$ cwt., is 30 feet in length between the two extremities of the stilts, 10 feet in the length of the sole, which last has a bearing surface of 10 superficial feet, and leaves an open furrow of 2 feet in width.

The consumption of coal required to perform the above operation is from $1\frac{1}{2}$ to 2 tons, according to quality, per day. The number of men required would be as follows,—two to conduct a plough, one to attend the movement of the auxiliary machine, and one to prepare the end of the furrow next to the machine for the entrance of the plough in the succeeding *bout*. The full complement of men, therefore, for two ploughs or sets of harrows, &c. would be eight labourers, one engine-man, and one boy to assist in the machine.

It is quite possible that this description may not be strictly accurate, and it is presented merely for the purpose of enabling the public to form a general idea of the nature of the machine, and its mode of operation. There can be little doubt, that to Mr Heathcoat must be awarded the palm of having invented a steam-engine which is applicable to the cultivation of the soil, though to what extent remains yet to be determined. That it has been proved to be eminently useful in ploughing wet bog-land can admit of no question, and it only remains to be seen whether it can also be made serviceable in the ploughing of ordinary soils. The information now given is in many respects imperfect,—the deficiency will probably be supplied by the Report of the Deputation of the Highland and Agricultural Society, which will no doubt be made at the general meeting on the 3d of July next.

[These three essays on Tile-Draining are those alluded to in the preliminary notice, and which were to follow the papers on the manufacture of tiles.]

ON TILE-DRAINING. *By Mr JAMES CARMICHAEL, Raploch Farm, Stirlingshire.*

[The Premium of Ten Sovereigns was awarded for this Essay.]

THE purpose of this essay is briefly to elucidate the principles of tile-draining as now practised with increasing satisfaction throughout the empire; for it is one of the many recommendations of this system that it suits every soil, from the poorest to the richest, and may be used at any depth, and where stones cannot be applied, as in morasses or flow-moss. Moreover, it is less expensive, and second only to the best stones in duration; for if a tile should give way it can easily be replaced, or a whole drain reopened and renewed at pleasure, which is impracticable with stones. Besides, being more portable, tiles can always be had of any size, shape, or strength desired, in those clayey districts where stones are with difficulty procured, and may therefore safely be taken as the best substitute for stones in ordinary draining. Shut up from the influence of the weather, and secured from every injury, it is impossible to limit their duration, or conceive any thing better calculated for the purpose of draining.

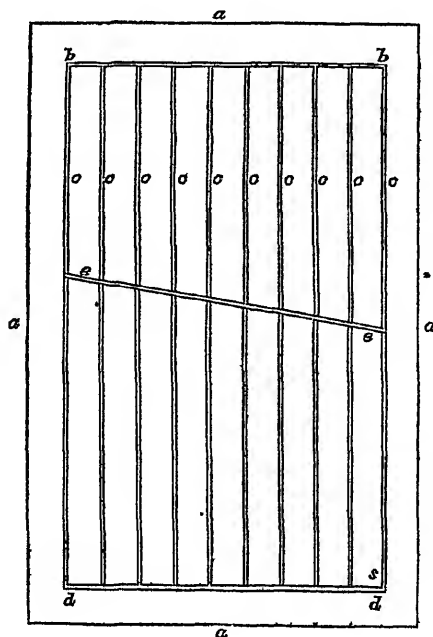
In laying out ground for draining, the positions of the main and sub-main drains,—if the latter are necessary, as in undulating or large irregularly formed fields,—are first to be determined, and marked by a series of small pits along the proposed line. Mains should never be less than three paces from a hedge or stone wall, lest the roots of the former, or pressure from the latter, injure the drain, particularly where forest trees are interspersed with the thorns. But old open

ditches, where such roots have attained an opposite direction, may be converted into mains and covered at little risk ; or in small fields and short minor drains, the main may be placed in the headland furrow, where it also serves the purpose of a minor drain, the spreading fibres from the hedge, or the sunk base of the wall, abstracting much of the headland verge moisture. In uplands, where the field to be drained forms the base or slope of more elevated ground, a cross drain should run near to, and somewhat parallel with, the highest side of the enclosure, diverging to the right or left, or both if necessary, to give it an outlet. This drain is to be preceded by a line of pits, five to six feet deep, to ascertain the state of the subsoil, so that the under as well as the surface discharge be detected ; because experience has often shewn, that one oblique or diagonal drain will in such situations prove more beneficial than a number of direct drains ; it being found that a bed of clay, like a ledge of rock, cropping out in rising ground of unequal texture, and intercepting the latent spring below, abruptly forces it from a great depth to the surface, while, but for this casual barrier, it would have, perhaps, passed quite beyond the whole field, in its hidden channel, without approaching the surface. In this way a single drain will suffice in shaken strata or flat sandy subsoils. The dimensions of this cross or catch drain must depend on the distance it extends, and the nature of the deposits it embraces. If no springs are found and the soil is uniform, the drain may be twenty-four to thirty inches deep, and six to seven inches wide at bottom, to admit a four to five inch tile and sole. Should the drain exceed 200 yards in length, with only one outlet, and much spring-water appear, larger tiles are required, and also a side main, into which the catch-drain of two adjoining fields may be conveyed, if preferred ; or if the acclivity is great, the side-main may be left open, and prove very essential while the land is depastured, for which purpose, or to form ornamental ponds, the springs of one field may be

led either open, or covered over a whole farm, and proper watering places, with troughs or pumps, left in each inclosure.

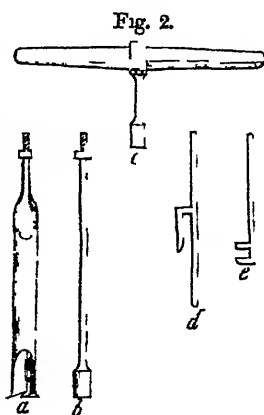
Having determined the mains, the minor drains are to be next proceeded with. These, from being first tried in the furrows which separate the ridges in corn land, are termed parallel or furrow drains. Here it may be proper to remark, that, at this stage, or at least before the close of the ensuing operations, a sketch should be made of the area drained, or such notes taken on the spot while the whole is fresh and full in view, as will enable any one to trace any drain, correct any defect, or make any alteration required at any subsequent period, or in the event of the form of the field or direction of the ridges being afterwards altered. Let the following diagram, Fig. 1, represent the field to be drained, *aaaa*

Fig. 1.



being the fence, *bb* the catch-drain at the top, *cc* the parallel or furrow drains, and *dd* the main-drain at the bottom, with an outlet at *s*. Where no springs occur, *bb* is placed in the headland furrow, about eighteen feet from the line of the fence, with *cc* or the furrow drains all emanating therefrom, and terminating in *dd*, the main, or if necessary, in one or more submains as *ee*.

These preliminaries adjusted, the drainers are ready to break ground at the lowest point of the field, where the main commences and continues gradually to ascend, due care being taken to preserve an active and uniform fall throughout, which in all doubtful cases should be correctly ascertained at the moment, by instruments, if no water appears. The dimensions of the main must in a great measure be determined by the discernment of the operator, and the probable volume of water to be voided; and this again depends on the quality as well as the quantity of ground in hand. In estimating this, he will partly be guided by the state of the *trial* pits already noticed, which may be made in several parts of the field beside the track of the drain, and deepened, if required, by a boring rod or drain auger, which is denominated *tapping* a field (Fig. 2). If little pure water appears in these pits at the expiry of a day or two, it may be inferred that no springs are near, and his attention will chiefly be directed to the removal of the surface water. It is better, however, to provide for every possible contingency, by allowing ample space for



any sudden influx of water in great floods or falls of snow, regard being also had to the fact of gutters from the highways emptying their muddy contents into the adjacent fields, which are

very apt to glut covered drains ; keeping in view also that the greater the depth of the sectional area of the confined stream, the greater will in all cases be the velocity of the current. Water will flow at a very slight inclination from the horizon, and where more cannot be obtained, a fall of one inch in twenty feet is sufficient to preserve the bottom of the main from any deposits, provided the tiles are kept entire, and the estuary clear. There is more danger attending the greater than the lesser fall in tile mains ; for even in the heaviest rains, the water issuing from new drained ploughed land is only slightly changed in appearance from that of a brook in fair weather.

When the fall of a long main is very considerable, it can with little trouble be divided into two less rapid descents, by a break near the middle, where the upper part may drop open or concealed a few feet perpendicularly into the lower section of the main. If the field is about ten imperial acres, and nothing but surface water anticipated, the main, which is dug as a common drain, with a moderate fall, may consist of one tile, 8 inches by 10 inches within, and the bottom cut as near the breadth of the sole as possible, suppose 12 inches ; if for two tiles and soles abreast, 24 inches, which is a much stronger form than tiles reversed without soles, and the closer the soles are to the sides the better, but they must rest fairly and freely on the bottom. Those who prefer the tubular form of main drains, with inverted tiles without soles, must bear in mind, that unless these tiles are made with flanges, they are exceedingly apt to slip from their juxtaposition by the mere action of the current, and many other causes. It can seldom be the object or interest of the tile-drainer unduly to accelerate the discharge or limit the area of the drain to the probable quantity of water to be collected, which should never exceed half the capacity of the drain.

In laying these tiles and soles, a man enters the drain, and placing the first sole at the estuary 12 inches or more

above the bottom of the open ditch into which it flows, he lays another sole at the end of that, and then lays a tile on these, leaving two or three inches of the first sole uncovered, to conduct the discharge of the main, causing it to fall on an inclined flag or course of stones, to prevent the stream from undermining the tiles, which are at the same time securely packed with soil at the sides, built round with bricks or stones in front, and finished with turf, green side out, over the sloping summit of the whole (Figs. 6 and 7, Plate V.) A grating is also necessary to exclude vermin. This done, he proceeds to lay soles and tiles alternately, carefully removing every inequality or loose soil from the bottom with a small trowel, and pressing each successive sole and tile close to the preceding, so that no irregular joint be left to obstruct the stream;—especial care being taken that every portion of main or minor drains are laid as soon as opened, otherwise much additional labour and inconvenience will result from the sides bursting in under the pressure of the accumulated soil, or from change of weather. The tile-layer thus continues, having his face towards the part finished, and moving backward as the work advances, till he reaches the termination of the drain. The tiles are previously spread along the edge of the drain from a cart, and if the cutting is deep, an assistant hands the tiles, to expedite the laying; and whatever the size of the drain may be, the operation is precisely the same. Where the main is double, two soles are laid side to side, or if long enough, across the bottom, and two tiles abreast as before; if it is triple, the third tile, with or without a sole, is placed over the first two; if four tiles are taken, the first two are inverted, and the soles laid above them, with other two tiles over these, in the common form (Figs. 2, 3, and 4, Plate V.) The two lower tiles require to be tightly packed with tough turf all round and between their sides, the whole regularly covered over with turf, green side under, if that can be procured; if not, a good coating of

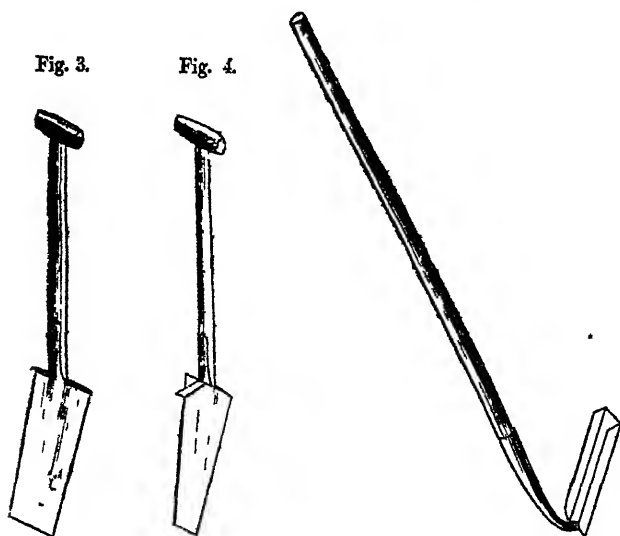
straw, or small brushwood of any kind, will serve to keep the soil which is immediately thrown in, from penetrating the joints of the tiles.

It is sometimes necessary in deep mains through sand or friable subsoil, to have recourse to cradling with wood to preserve the side, while the cutting goes on by means of a platform, on which those below throw out the soil, which is removed by others to the side, or over the finished part of the main, the intended fall being noted on the boards at each shifting of the cradle. And where an open-cast is required, as a continuation of a close main in very flat situations, communicating with the sea, or tide-flowing river, the breadth of the cast is generally twice its depth, or as 15 is to 30, to give the requisite slope to the sides. In this case the surface soil, if of grass land, is cut into *sods*, and laid aside; then the subsoil is removed, which is afterwards thinly spread near the verge, or sunk into prepared trenches or other hollows, and covered with reserved surface soil. The bottom of the level may be two to three feet wide, and the sides covered with faggots of twigs of any kind, two to three feet in length, and six to ten inches in diameter, laid in a direction at right angles to the water course, commencing at the bottom, each layer of faggots receding about a foot from that below it, and the whole held down by as many courses of the original sods, grass side up, as there are of faggots, to prevent their sliding till compressed and covered with verdure. Both sides must be railed in from the reach of sheep or cattle, and may either be annually cut for hay, or profitably planted with willows.

The mains being speedily completed by a number of hands, the minor drains are conducted in a similar manner by two men to each drain; the first, with a common spade, commences at the proposed junction of the drains, and working backward, removes a spitful of soil along the line of the drain; the second steps into his track, and shovels out the loose soil left by the first spademan, who then returns,

and with drain-spades (Figs. 3 and 4) digs down on the side of the main till he comes in contact with the tile, and cleaning out the soil forms the inlet to the main, and receding as before, alternately casting out a few spits of subsoil, and drawing the cleaner (Fig. 5) along, lifts out any particles that remain, leaving the bottom clean and ready for the tiles. The subsoil, when of inferior quality, is invariably laid on the opposite side of the drain from the surface soil. The men thus go on in pairs from drain to drain throughout the field, the tile-layers keeping close behind, that no drain may be left overnight unlaid, the drainers by piece not being bound to repair any damage arising from such neglect, which may often prove very considerable. In very siliceous soils, where the under-water bursts down the sides of the drain almost as soon as formed, an attendant stands by with a spade ready to place it against the one side, while another is put opposite till the tile is laid, when the spades are withdrawn, and a piece of turf put into the last laid tile to prevent the sand

Fig. 5.



from getting into the drain while the next place is preparing, when the turf is removed, another tile laid, and closed with the same turf in succession.

In forming the minor drains, the inclination or fall should always be greatest near the estuary of the main : this will prevent all impediments to the free discharge of the minor drain ; but as the entrance of these cannot well be admitted through the top of the main, it should therefore enter directly at the side, as will afterwards be described, with a regularly sloped bottom tile, the better to resist the action of the water. From the importance attached to the tile part of the operation, all the drains are generally laid by a trusty servant, or experienced person on day's wages.

In covering the tiles various expedients have been resorted to, with the view of ensuring the greater permanency of the drains. Stones, gravel, scoria, refuse of the foundries, and ashes of furnaces, have all been used, than which nothing can be more applicable, but unfortunately these are all confined to certain localities, and even create much additional expense. Peat-moss also answers well. To the majority of drainers, however, no alternative is left save sods, small brushwood, or straw, and whichever of these is used should not be scantily supplied, particularly in strong adhesive clay soil, where the compression caused by the continual treading of the teams in cultivated land, is most apt to bring the clay into closer contact with the tiles and mar their utility. It was this consideration which suggested the idea of leaving holes in the tiles, or placing the drain a little to one side of the furrow, both of which plans have now become the less necessary where the above precautions are duly attended to, and no teams allowed to go along the furrows in harvesting the crops.

Refilling the drains, when the soil is good, may either be performed by the spade, or with a common plough having a temporary mould-board about double the ordinary length, and a master-tree in proportion attached, which enables the

two horses to keep at a distance from the drain, and replaces a sufficient quantity of surface at one furrow. A diagonal scoop has sometimes been applied to the same purpose; but where all the furrow soil is of inferior description, the drains should be filled by the spade with the best soil of the ridge, and the original soil of the drain, however steril, may be minutely spread over the crown of the ridge, or carted to land of a different texture, such as clay to sand, and *vice versa*, where it will prove excellent top-dressing. Nothing but the best vegetable mould should be admitted into the drains, as that alone will retain its elasticity and admit the surface moisture to the tiles, which is the chief object of clay-soil draining, by which the winter rains having penetrated to the bottom of the cultivated soil through the rents or cells caused by the summer drought, instead of remaining pent up and chilling all around, are drawn off by percolation into the drains, which percolation is obviously promoted by the curvature of the ridges; these need not, however, be above five inches higher in the crown than the sides, and the furrows, when the field is sown, may be marked by a small ratch of the plough to distinguish the ridges.

After careful inquiry and inspection of those districts in Scotland and England, where tile-draining has been adopted, it would seem that the distance between the drains is, by common consent, regulated by the breadth of the ridges, the practice being to put a drain into every furrow, and where those broad bent ridges which still disgrace agriculture are being reduced, they are re-formed into 18 feet ridges, with a drain in the party furrow. Eighteen feet may therefore be held the prevailing distance from drain to drain, where no parallel ridges of less breadth previously existed, and no springs occur; and 24 inches may be assumed as the maximum, and 18 inches the minimum depths of furrow drains, varying occasionally as soil or circumstances may direct; the width at top being 12 to 15 inches according to the intended depth, and

the breadth of bottom exactly fitted to the size of sole and tile used. Where the soil is pervious, and any material of good quality for covering the tiles can be had, the drains are 22 to 24 inches in depth, and, in default of that, 18 to 20 inches is the depth ; which, allowing 5 to 6 inches in the latter, and 9 to 10 inches in the former for materials, leaves about 15 inches for the action of the plough, which is deemed sufficient, as the closer it goes to the tiles the better, so long as these are not disturbed, which can hardly happen even in subsoil or cross-ploughing such land, these being always the deepest furrows ; and the depth of earth over the drains annually increases over the entire field.

No evidence has yet been obtained of the advantages to be derived from abandoning the ridge form, and ploughing the land in breaks or single furrows. Sometimes, it is true, two 12-foot ridges being drained in each furrow, have judiciously been thrown together ; and the same has perhaps been done with 15 or 18 feet ridges ; but these instances are so rare and recent, as to be of no avail in deciding the point. Indeed, few appear to have thought of the matter, and find no fault with ordinary sized ridges, since, by means of tile-drains, the furrows now produce the best crops ; and certainly for all the purposes of ordinary husbandry and most approved modes of ploughing, sowing, and reaping, nothing can exceed the convenience of 18-foot ridges, and none need now be under that breadth even in the moistest clay soils.*

In permeable soils, or in laying out lawns or fields for permanent pasture, a different course is doubtless eligible, and ridges may be omitted ; but this implies additional draining, and must therefore be taken as the exception to the rule which the corn-farmer may in prudence follow. In reference to the

* So far as the act of ploughing is concerned, 18-foot ridges are as convenient as 15 ; but for sowing corn broadcast by the hand, using the grass-seed sowing-machine, and close harrowing with angled harrows 15 feet, we are of opinion, is a much more convenient breadth for ridges than 18 —*Ed.*

time for commencing operations with the best advantage, that must in some measure depend on circumstances and the views of the designer, which may be pursued at pleasure. But to the practical farmer no season can be so suitable as that when the land is clear of crops and cattle, the servants at leisure, and pastures of least value, that is from autumn to April; and the work can then be done with more precision and less expense. The state of the soil as to *wet* or *dry* is then most apparent, and drainers more readily procured who can perform their task with greater ease to themselves and benefit to their employer than in dry summer weather; for by draining, in the absence of water, operatives are ever liable, in flat situations, to lose the *level*, and no instrument will satisfy or conduct them like the liquid stream trickling along their narrow path. In parched fallow land, it has often been found necessary to empty a few pails of water into the drain to ascertain the fall before the tiles could with propriety be laid. Where stubble-land is to be drained, the carting of materials is much easier accomplished before the winter furrow is completed: if that cannot be attained, the first steady weather thereafter should be embraced, or the draining delayed till spring, or each alternate furrow may be done at one time, and the intermediate furrows left till such subsequent season as best suits the rotation of crops.* But at whatever time the drains are executed, the process will be greatly facilitated by first introducing the plough, without the mould-board, along one side of the furrow or line of the drain, and returning on the opposite side with a plough having the mould-board on; which removes five or six inches of soil, leaving a straight and clean cut opening for the drain, and abating about a 1d. per rood from the price of casting. Deeper furrows are sometimes attempted, and ponderous ploughs, with ten or twelve horses, have been constructed, to excavate the

* See the remarks of Mr Stirling on this view of the subject in the following essay, page 98.—En.

whole drain at once, but not in so satisfactory a manner as to excite imitation, or justify the enormous tear and wear it occasions. Should the draining be protracted till the land becomes dry and pulverised by repeated ploughings, the soil must be raised a little higher over the tiles than when moist, and a roller may be passed along to compress it, if the land is to be immediately reploughed ; but this, except in the case of very shallow drains, will seldom be necessary, for well made and properly laid tiles will sustain much greater pressure than is generally imagined, and the plough may cross a tile-drain with twelve or fifteen inches of soil over it, without danger, almost as soon as completed. It may, nevertheless, be well to allow a little time to elapse before teams approach in a direction parallel to the drain.

That tile-draining is less expensive than draining with stones, will be evident from the annexed table ; and the circumstance of the drains requiring to be so much deeper for the latter than the former material, to keep both at an equal distance from the reach of the plough, without adverting to the fact of a greater fall being necessary for a stone-drain than a tile, must of itself frequently decide the question of expense in flat situations. It is on that account that the 20-inch stone drains are given in the table, otherwise they would not merit notice ; and it is to be observed that these drains are preferred in the Carse of Gowrie, where two tile-works have been established, and abandoned from want of encouragement. Even admitting that they are cheaper, they are infinitely inferior to tiles, on account of their shallowness ; stones, within 8 inches of the surface, being liable to be displaced by the plough, and mixed with the soil above, whilst those below sink into the bottom, softened by the stagnating water, which is unable to effect an escape, through the promiscuous mass of stones and soil.

Minor drains, whatever their equidistance may be, should never exceed 200 yards or so in length, without being inter-

sected by a main or submain; because, if the fall is considerable, the bottom may be endangered by the velocity and volume of water collected during continued rain, or if the declivity be very limited, and the aperture small, the drain is in danger of bursting from an impeded discharge. Therefore, the rule is to apportion the area of all drains to their length, declivity, and distance from each other. And a little observation and experience will naturally point out the medium line of procedure; for on all thorough drained land, it will be found that the surface or rain water disappears gradually but regularly, and in absence of springs, it may perhaps rain a whole day without making any great appearance in the drain, for it is not until the ground is completely saturated that the run becomes large or lasting. Thus, supposing the length to be 200 yards, and the distance from drain to drain eighteen feet, the square feet of surface receiving rain water for each drain will amount to 10,800; this, at two inches of rain in twenty-four hours, will give 1800 cubic feet of rain water; and taking the sectional area of the smallest, or $2\frac{1}{2}$ to 3-inch tile, at 7.5, and the water moving in this aperture at the rate of one mile per hour, the number of cubic feet discharged by the drain in twenty-four hours will be 6600, or nearly four times as much as is necessary to carry off a surface fall of two inches of rain, and with greater certainty than by a stone filled drain of the same size and declivity. In reference to the greatest declivity which may safely be given to tile drains, it is plain that no definite rule can strictly be applied, where so much depends upon adventitious circumstances; in general, however, furrow-drains may, with perfect security, be conducted on any acclivity that the plough can surmount. All extreme cases can easily be obviated by additional submains; thus, even an angle of 15 degrees may be broke into short runs of 30, 50, 80, to 100 yards each, leaving two to three yards of uncut soil between the submain and the next lower furrow-drain, (see

cut, Fig. 1), which lessens the expense of minor drains without diminishing their efficiency; or, if preferred, the sub-mains may be cut so deep as to allow the furrow-drain a continuous line. A quadruple main with four tiles, each eight by ten inches, (Fig. 4, Plate V.) would, at the same slow movement, discharge in round numbers 289,350 cubic feet of water, or equal to about forty acres of surface, at the rate of two inches of rain in twenty-four hours. But suppose the water to move in this main at the rate of ten miles an hour, or that the drain has a fall of about one foot in 39 or 136 feet in a mile, the discharge in twenty-four hours would be about 2,816,000 cubic feet of water, or almost sufficient for 400 acres of surface as above. But the utmost pains will profit little in forming the drains, unless equal care be bestowed on the preparation of the tiles and soles.

The strongest form of drain-tiles is that of the round arch or semicircle, with perpendicular sides, which form requires less breadth of casting, stands higher, and by its narrowness increases the velocity of the discharge through the drain. These tiles are, however, sometimes arbitrarily numbered according to their size, the smallest being at some works termed No. 1, and at others No. 5. or 6. Now, as uniformity of designation is, in all such matters, very desirable, it were better to class the tiles strictly by their size or capacity; and as the small tile is the most commonly used in furrow-drains, let it be No. 1, the next largest No. 2, and so on, say by an advance of one inch in width each size.

Thus :—No. 1.—3. by $3\frac{1}{2}$ inches within.

2—4. ... 5 do.

3.—5. ... $6\frac{1}{2}$ do.

4.—6. ... $7\frac{1}{2}$ do.

5.—7. ... $8\frac{1}{2}$ do.

6.—8. ... 10 do.

With a corresponding thickness, No. 1. being fully three-fourths of an inch, and No. 6. nearly two inches thick from the kiln, except where the clay and manufacture are very su-

perior. For it is manifest that, in thus dealing with water, increased capacity necessarily carries much greater pressure with it, consequently more strength is required.

The soles are in many cases too narrow ; they should project nearly $\frac{1}{4}$ inch in small drains, and $\frac{1}{2}$ inch in large drains, beyond the sides of the tile, otherwise the tile may slip off at one side, and allow the water to undermine the whole work. Soles may certainly be more sparingly used than they have been by many persons. Where the bottom is a bed of retentive clay, or a firm substratum of any kind, the acclivity moderate, and the drain short, soles may safely be dispensed with in minor drains, as any water likely to accumulate there is so inconsiderable as never to affect the bottom ; but where the ground is flatter, though in other respects similar, the want of a run causing the bottom to swell up with partial moisture, and to lessen the cavity of the drain, half soles should be used ; they are prepared on purpose by a slight draught made across the centre, so that they can readily be broken into two pieces without waste, and one of these laid under the connecting ends of the tiles, leaving their centres blank. In soft soils where the fall is greater and longer, full sized soles must be used. But however easy they may be to prepare, curved soles are not always the most economical or most generally preferred, except in very soft bottoms, because by the pressure from above, it is plain they are in danger of being broken longitudinally, and the water thus running along the fracture must penetrate below the sole ; or the soles may perhaps remain whole, and the water, passing by the cross joints into the vacancy under their edges, may in either case destroy the drain. Much waste is also occasioned by the mode of connecting the minor with the main drains as practised in some places, which is by breaking off the corner from the large tile, in doing which the tile frequently falls to pieces, and a second, if not more, shares the same fate ere one is got to fit. At other places again, a small space is left between the

two tiles in the main, where the minor drain enters, but this plan is objectionable also, because the pieces of broken tile laid over this opening may be forced off or fall into the drain, all which may be avoided by cutting off a corner from a few tiles in making, or leaving a circular aperture in the side of as many large tiles as are likely to be required.* A draught should also be made across the middle of the other tiles occasionally, to save a whole tile where a half one only is wanted.

There is yet another very important consideration in tile draining, namely the expense, for although this is now a little less than formerly, still there is every reason to believe, that greater reductions might be made in the price of tiles, with perfect fairness to all parties. But this can only be effected by the landlords encouraging the erection of new tile-works in central situations, which would at least secure a ready supply of better tiles, even if the price remained unaltered. The risk and expense of long carriages might thus be avoided, and it would be no great sacrifice in behalf of depressed agriculture, were tiles, lime, and similar articles, permitted to pass toll free.

The following table is constructed from the current prices of furrow draining, and includes the laying of tiles, but not replacing the soil. The number of yards assumed to the imperial acre will nearly cover the charge of sub-mains also. The expense of carriage is taken at 5s. per day for each man and horse so employed, and the materials are supposed to be equidistantly situated from the respective drains, so that one cart conveys five loads of tiles, and the other five loads of stones in the day. But one cart proportionally filled with 14-inch tiles and soles will lay upwards of 100 yards of drain, while one cart or cubic yard of stones will only lay 18 yards of a similar sized drain, viz. 6 inches by 12 inches, being a

* See Mr Boyle's essay on the manufacture of draining tiles at page 21 of the last number of the Transactions.—Ed.

saving of labour of nearly 6 to 1 in favour of tiles. The stone drains are estimated at 1d. per lineal yard of 20-inch drain, including all but the carriage and covering the stones, which is the lowest alleged rate at which the work can be performed under the most favourable circumstances.

TABLE shewing the Size and Expense of Tile-Draining.

Soil.	Space apart.	Depth of Drain.	Breadth of Bottom.	Yards in Acre.	Price of Carting and Laying.	Number of Tiles and Price.	Number of Soles and Price.	Cost of Carting.	TOTAL.		
	Feet.	In.	In.		per 36 yds.	3/ per 10	1/6 per 100		£.	s.	d.
Aluminous Clay.	15	20	5	968	/10	2500	1250	11/	6	7	11½
	15	22	5	968	/11	2500	1250	11/	6	9	4½
	15	24	5	968	1/1	2500	2500	12/	7	13	7½
	18	20	5	806	/10	2080	1040	8/	5	4	8
	18	22	5	806	/11	2080	1040	8/	5	6	6½
	18	24	5	806	1/1	2080	080	10/	6	7	10
	21	20	5	691	/10	1780	890	7/	4	9	8½
	21	22	5	691	/11	1780	890	7/	4	11	3½
	21	24	5	691	1/1	1780	1780	8/	5	8	11½
Mixed Clay.	15	18	5	968	1/2	2500	...	8/	5	14	4
	15	20	5	968	1/4	2500	...	8/	5	18	10
	15	22	5	968	1/5½	2500	...	8/	6	1	8
	15	24	5	968	1/7½	2500	1250	0/	7	6	10
	18	18	5	806	1/3	2080	...	7/	4	15	6
	18	20	5	806	1/4	2080	...	7/	4	19	1
	18	22	5	806	1/5½	2080	...	7/	5	1	6
Alum. Clay.	18	24	5	806	1/7½	2080	1040	8/	6	4	2
	18	20	5	806	67/3	44½*	...	44/9	5	11	11½†
	18	24	5	806	72/10	44½*	...	44/9	5	17	7½†
	18	27	5	806	78/4	44½*	...	44/9	6	3	1½†
* Carts of Stones.					† Stone Drains.						

Description of the Figures referred to in this paper. The Cuts are embodied with the text, and the Section of Drains, in Plate V.

The Cut, Fig. 1, is a plan of a drain-field, see page 83.

Fig. 2. *a, b, c, d, e*, are the implements for boring.

a, the auger, somewhat resembling a carpenter's auger; the shell may be 1½ to 2 feet long, and the diameter is usually 2½ or 3 inches.

b is a length of the boring-rod, which screws upon the top of the auger; to these are added one or more lengths, and always surmounted by the brace-head or handle *c*.

d and *e* are two keys, by means of which the parts are screwed or unscrewed, see page 84.

Fig. 3. Draining-spade, following the common spade.

Fig. 4. Do. do. following No. 3.

Fig. 5. The scoop or cleaner. See page 87.

Plate V. Fig. 1. Section of a common tile-drain, in which *a a* is the natural surface, and the different degrees of shading exhibit the position of the different kinds of material used in fitting up the drains.

Fig. 2. Section of double-main or sub-main drain, in which two lines of tile are set side by side, and covered in as above.

Fig. 3. Section of a triple-main, in which two lines of tile are set, as in the former, and a third line placed over the other two, with or without a sole interposed.

Fig. 4. Section of a quadruple-main, required only in extensive drainages. In this, two lines of tile are set in a reversed position, over these a line of soles crossing the tile; and, superimposed on this, is another double line of tiles in the ordinary position. See page 86.

Fig. 5. Section of a tubular drain, in which one line of tiles is laid in the reversed position, and another over it, in the ordinary way, forming an oval canal, which may also be divided by the interposition of a line of soles laid betwixt them. See page 85.

Figs. 6. and 7. Section and bird's-eye plan, exhibiting the manner of forming the estuary of a main-drain, falling into an open ditch.

a, the bottom of the ditch.

b, the facing, built with stone or brick, round the mouth of the main.

c, the edges of the ditch; and,

d, the line of tiles. The same letters apply in both figures. See page 86.

ON TILE-DRAINING. *By S. D. STIRLING, Esq.
of Glenbervie.*

[The Honorary Silver Medal was awarded for this Essay.]

I HAVE ascertained that the water which flows from a drain is considerably less at any one time than what formerly ran on the surface. I have only three sets of drains in which I know the exact fall in the mains near the mouths and the area drained. The land is mostly stiff clay, having in some places a fall of 1 in 6, and for 50 yards from the mouths of the mains only 1 in 140; is drained at 15 feet; the main tiles are $2\frac{3}{4}$ inches by $3\frac{1}{2}$ inches, and the rain which falls on 5 superficial roods is discharged at each mouth. I find the tiles nearly two-thirds full after very heavy rain; therefore, that size of tile would, with the same declivity, pass the rain which falls on nearly two acres; if the fall on the side-drains were less, the water would never stand so high in the mains. Water will run in any thing which is not level, and if the fall is small, the tile must be larger. I have practised putting smaller tiles below larger ones where there was a great increase of fall.

I am inclined to believe that there is an unnecessary fear of putting drains too deep.* I have lifted old and shallow drains which were not making any visible change in the grass, whereas I find an evident improvement to the distance of 8 feet in each side of drains which are 5 feet deep with only a box in the bottom. I think the surface is kept wet by capillary attraction, and that the bottom of the drains ought to be at least 30 inches from the surface. The three sets of drains formerly mentioned confirm me in this opinion; they were made three years ago with the view of ascertaining the

* Mr M'Connell, the great road contractor, insists that the drains on each side of the road in stiff soil should be two feet below the metal bed; if this is necessary to dry the surface, the farmer ought to put his drains as much deeper as he expects the roots of his crop to penetrate.

comparative merits of different modes of filling and depths of cutting, and also the distance which the filling ought to be from the surface. No. 1 was cut at 24 inches in the furrow, (30 inches from the uniform surface); Nos. 2 and 3, 6 inches deeper. No. 1, tile and sole covered with a turf; No. 2, tile and sole, with 10 inches of broken stones; No. 3, 15 inches of broken stones over main-drain tiles. The top of the tile in No. 1 is 4 inches deeper than the top of the filling of the others; yet it begins to run nearly an hour sooner after heavy rain preceded by drought. It is not, therefore, through the top of the drain that the water finds access, nor ought it to be so, but it ought to run through the soil. The effect of these different depths of drains will be this,—during winter 6 inches of the soil below the bottom of the tile in No. 1 will always be saturated with water, and that, perhaps, nearly with the same water; whereas 6 inches at the same depth in Nos. 2 and 3 may occasionally be filled with air, and will thus become friable, and capable of containing more water, and will always have the advantage of a change in the water. While in summer the shallower drain will conduct off a heavy shower, and the other will have a reservoir of water deeper by 6 inches, ready to be drawn up for the use of plants, which, when empty, will be replenished by the moist air entering it during the night. The result will be, that properly drained land will be drier during the winter, and more moist during summer than it was before. I have frequently observed, that, when every undrained furrow (after a heavy shower in summer) was running a burn, no water came from the mouths of the drains. Every one has seen rushes growing on the crowns of ridges gathered to the height of two feet, where the furrow may be called a drain two feet below the crown.

The advice I would give as to the distance between the drains is to follow the breadth of the former ridges, as this will generally be found to vary according to the tenacity of

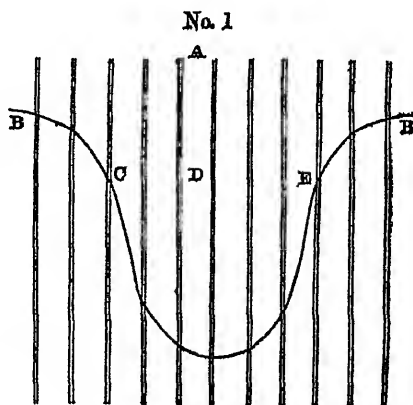
the soil. Something may be gathered from sinking pits at different distances from an experimental drain, but in one case where I tried this plan, it appeared that the water did not decrease in a pit 5 feet from the drain; the land has been since sufficiently dried by drains 15 feet apart. No one but a geologist writing to a geologist could explain the differences of soil requiring to be drained at distances varying from 15 to 20 feet; if land is not dried by drains at 14 or 15 feet apart, I should doubt its repaying any further outlay. The proof of clay land being sufficiently drained is, that in summer it shall crack in all directions, while it is unameliorated by deep working and manuring. This I have reason to know goes on in the subsoil after it has ceased in the improved surface, and in winter that little or no water shall *flow over* the surface. I think it a great error to make half the number of drains required at first, with the intention of putting one between each at a future period; a tid (or proper condition of the ground for harrowing) cannot be taken advantage of on the drained furrow until the other is dry, and the benefit of an extended period for performing the various operations of the farm is thus lost. Let what is drained be done as thoroughly as the farmer's exchequer will allow; the farm will be gone over in as short a time, and much more profitably.

As to the direction of the drains, they are generally made in the furrows, as there is a saving of cutting; but that a furrow should be allowed to remain over the drain, no one who is acquainted with the manner in which draining fertilizes soil will for a moment permit. The land acquires a new power, viz. that of respiration, and it is by causing the rain to run *through* the soil, not *off* it, that draining does good, and if any furrows are left, the water will have a greater disposition to run over the surface to those furrows, and run along them, than to filter through the soil. Even if the drains are in the

furrows this may happen, and it is the lesser of two evils ; the alternative being, that it shall flow into the drains from the surface, carrying soil with it, which will very soon close their career. People are adverse to levelling ridges, as a great many fields have been injured by the operation, but draining and subsoil ploughing were then unknown. I have levelled land which was gathered a foot without any injury, the furrow-slices being drawn rather deeper than usual in proportion to their breadth, which sets them on edge, the hollow left on the old crown being filled by cross-ploughing. *

It is, however, unreasonable to expect that the direction of the furrows should be the most eligible for drains, especially in undulating land. We consider that they are always squared off one or other of the fences. I shall give my reasons for believing that drains should always be made to the greatest fall ; the evils arising from excess of fall in the side drains must be corrected by the interposition of more mains. In draining a piece of land, which is represented in the annexed figure, No. 1,

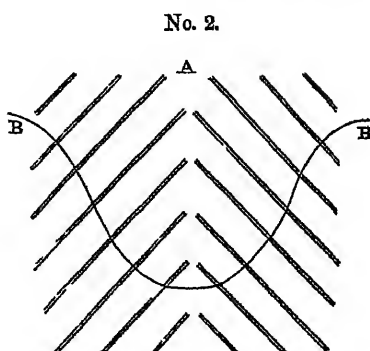
in which A is the top of the hill, BB a horizontal line drawn on the surface, and CDE the old furrows. I found the drains CDE very apt to slide in, and concluded that they were running parallel to the banks of sand,



which I believe will be found in all clay not run in to its present situation ; and which are very useful as conductors of

* See vol. ix. p. 34. of *Transactions*, for an account of a simple and cheap plan of levelling gathered ridges, by Mr Carmichael, of Raploch.

water. Had the drains been made diagonally as in figure No. 2, where BB again represent the horizontal line, I believe they would have been more effectual in drying the land by cutting these banks at shorter intervals. I have also observed that the cropping out of beds of till, as indicated by the wetness on hill sides, is generally



horizontal. I wish all drains to be at right angles to the tilly strata, as they will pass through them in a shorter distance, and also to the sandy, as they will have more frequent opportunities of receiving water. In the absence of any indication of the lay of the strata, I would recommend drains to be as far as practicable to the greatest fall, but the furrows may be used when they do not vary far from it.

I conceive it absolutely necessary to put a sole to every main drain, and also desirable to put one under every tile. No doubt there is some land so hard as to supersede the necessity of this caution, but this is of rare occurrence; if there is any part softer than another, or if any obstruction such as a stone occurs, the water will wear the bottom of the drain; and if this goes on to any extent, the tile must sink, and the soil carried down will have a tendency to choke the main drains, which necessarily have less fall than the side ones. This may happen where the fall is rapid; when, on the contrary, land is very level, the water will remain a long time in the drain and make the bottom into a puddle, in which the tile is sure to sink. The beading which has been put round tiles, cannot be done at the present selling price, unless they are made by machinery. I have known instances of tiles without soles being choked in three or four years; the plan of

putting in half soles at the joining of the tiles is certainly preferable to using none. It is not as yet known to what depth moles may penetrate, but employing a sole sets them at defiance; they have been multiplied prodigiously by draining in my fields, where they were seldom before seen.

I conceive that the only material for covering tiles, the application of which will repay the additional outlay, is vegetable mould or turf, with which I propose to fill the drains in the following manner:—I first plough two furrow slices between each drain; the drainers are then directed to place the first spit eight inches from the drain on one side, and the subsoil at the same distance on the other. The furrow slices are then thrown on the top of the tiles, and a furrow ploughed off each side of the drain into it, one horse going on each side with a long master-tree. The first spit is then ploughed in, and the subsoil into the trench. These two last operations are performed by a plough, with a wooden mould-board two feet broad at the heel, and its sole level with the sole of the plough. The use of putting in the mould first is, that the water which finds its way towards any part of the tile may more easily run to the chinks, or rather to the opening between the tile and sole, where I should think the greatest part enters. The subsoil is put on the top, as the ridges are to be levelled; it is better to bury it than good soil; it will also tend to prevent the water from entering at the top of the drain, a point which cannot be too much insisted on. When any pervious material (such as tan-bark, bent, &c.) is to be had for nothing with a short carriage, I would recommend it to be used; but let the farmer count the cost, and not deceive himself, that it does not add to the expense, because he does not pay for it. Main-drains should be used when it is practicable, and as many as possible brought into one mouth, as it is at the mouth that mischief generally begins. Moles go there in spring in search of water, and push out soil; the eddy of the stream into which the drain runs leaves a deposite,

to remove which obstructions requires a quantity of water greater in proportion as the fall is less rapid ; the advantages of scouring thus produced are very perceptible in the Carse, where the mouths of many drains are under water during every flood.

The main drains should be cut deeper than the side ones; the object of this is to prevent the water standing back in the side drains when the main is full. It will be seen that if the fall in the side drains is rapid, a less extra depth in the main drains will be required. The best plan of joining the drains is to dig the main drain the depth of the tile below the side drains, and run the small tile over it, leaving an opening of an inch between two tiles in the main; this may be easily brought opposite to the side drains by a shorter tile. In clay lands, where the drain can be cut accurately, I would recommend two tiles, one on its back, and the other placed on the top of it, as being cheaper than a larger tile and sole, which would contain the same quantity of water. The water also running in a narrower channel, is less likely to leave a deposite; but when the sides and bottom of the drain are irregular from stones, the difficulty of securing the tiles in this position is a great objection. I join the side drains to the upper of these by an eye-tile, the eyes being cut at different distances from the end, and is easily found to correspond with the side drain. I also put a few bits of tile at the junction. I cannot see the use of broken stones in a main drain, unless a tile or tiles cannot be procured large enough to pass the water; this will seldom be the case, except where there is a want of fall. I would then recommend stones, as they will produce a head of water to scour out the drain. If the drains are as deep as they ought to be, the horses may go on them as soon as they are filled. I drained and ploughed eight acres in three weeks; but the land will work much better if it is allowed to lie over a summer after draining.

Every one must know the necessity of putting main drains in hollows ; but they ought also to be placed where there is a rapid change in the fall, that is, at the bottom of a quick fall, where the ground below is much flatter, or in such a direction along the face of the hill as to give a sufficient fall in them ; the object is, that the water which has been racing down this rapid fall shall not be allowed to run more slowly, or if so, at least in a larger volume ; although a small part of the rapid is below the main, the water will not have time to acquire any great velocity. The object of producing an equality of fall is to prevent deposite, which will certainly take place if the water runs at a less speed at the bottom than at the top of the drains ; for this reason I am very particular in leveling my mains, that they should, when possible, rather gain than lose fall towards the bottom. It is not of such importance that there should be much fall, as that there should be no lags in a main drain. If the fall is necessarily less at the bottom, it would be advisable to introduce more water at the point where this diminution takes place.

The comparative cost of tile and stone draining is the part of this subject in which perhaps the greatest difference of opinion will be found to exist. The last of the stone drains which I have superintended has been greater than what is stated below, owing partly to the damage done to the grass, it being necessary to do all the carting in summer, as we have had little or no frost, and partly to some of the drainers cutting the drains too wide from awkwardness. A chain of twenty-two yards of my drains has, on an average, required three carts of stones. As the data on which the calculation of the expense is founded are given, any one may alter them to suit his own circumstances. I have used upwards of 4000 cubic yards of broken stones in draining, and have now given them up for tiles ; not because I consider the latter superior, but from the impossibility of doing as much work as I wished

with stones without hired horses, which I cannot command. I decidedly prefer small stones to the couple or box drain, as being less liable to wear, choke, or be injured by vermin.

As to the comparative merits of tiles or stones, I shall not risk an opinion, but my belief is, that a drain filled with a quantity of stones broken so as to pass through a two and a-half inch ring, sufficient to allow of more water-way than absolutely necessary, the filling on no account to be within two inches of the deepest subsoil ploughing (that is, twenty inches at least) properly blinded on the top with small stones, gravel, engine ashes, or any other hard substance, with a moderate fall, and, where the soil is hard, with little sand, and not subject to back-water, will last during a 999 years' lease, if moles do not push soil into it. A tile and sole drain will last as long in spite of moles. The stone drain has the advantage of exposing a larger surface, and will take in the water more rapidly. Tiles are preferable where the land is flat. A tile and sole, with a few inches of stones, is the *ne plus ultra* of draining. I would recommend tiles to landlords who give any assistance to their tenants in draining, because they scarcely can make a bad drain with them, and seldom make a good one with stones, the carting of stones obliging them to neglect their other work. Many advocate stone-draining, because a great part of the expense, viz., the carting, falls on the tenant, and he will generally rather work than pay, but the consequences will often be, that finding the carting oppressive, he will wink at the drainers cutting too shallow, in order that he may consume fewer stones, and the drain will stop with his lease. The landlord should take the whole management of the draining except the horse-labour, and charge an additional rent, regulated by the improvement, by the former rent being high or low, and perhaps by the duration of the lease, without any reference to the cost of draining. It does not necessarily follow, that the land requiring most drain-

ing will make the greatest return. The tenant would be a great gainer though he were to pay every additional grain of corn produced, as he can work his farm with fewer horses. I know land where half the expense of draining has been repaid this year by the extra quantity of barley or turnips. In stating the cost of draining, I must be allowed to charge the horse-labour as if it were hired, and perhaps it is better economy to hire than to keep additional horses for the short time they are required, or can be employed in this work; it is quite improper to put young horses to it. The cost of quarrying and breaking a cubic yard of common freestone to pass through a $2\frac{1}{2}$ inch ring is about 9d. If rotten rock, or under very favourable circumstances, it may be less. If land stones, the breaking alone may exceed this sum. The cost of cutting a chain-length of a drain 30 inches deep in the furrow, 5 inches broad at bottom, and 8 inches at 15 inches from the surface, will vary, according to the soil, from 8d. to 1s. 8d., average 1s. 2d.* The cubic contents of a chain in length of the lowest 15 inches of such a drain are near 45 feet, to fill which will require two carts of stones, as the sand is mixed with them. A man and two horses will bring and string along the drains 960 tiles and soles per day from a distance, varying from four to five miles. Price of tiles and soles 40s. per thousand; † 57 tiles will lay a chain. The stones are supposed to be carted half a-mile. Hire of a horse, 3s. 4d.; a man's wages, 1s. 8d.; a driver's, 10d. per day. Two men fill sixty carts of broken stones into a cart per day, allowing for loss of time in backing to the bin,

* My reason for recommending this size of drain instead of a narrower one is, that our experience is not sufficient to prove what is the smallest size that will be permanent; at least, it should be of sufficient breadth to prevent moles from pushing soil across it.

† The price of tiles has risen considerably during the last month owing to the rise on coals; but the most sanguine coal-master can scarcely expect them to maintain their present price.

&c. If the stones are to be riddled at the bin, each filler requires a riddler. A man empties a cart, and is ready to return in two minutes, and fills a cart into a drain in fifteen minutes. A horse is allowed to travel at the rate of three miles an hour.

I prefer breaking stones in a bin. It is more easy to check the size, and it is done cheaper, as otherwise each heap has to be begun on the sward, and many of the stones are forced into the ground, which adds to the difficulty of lifting them. There will be a saving in carting the stones large, but it will be fully balanced by this disadvantage. I would deprecate of all practices that of breaking the stones in the field, and filling by the chain. This may be contracted for at a low rate, but it is easy to guess how the contractor makes wages.

I would recommend that the stones to fill two drains be laid on the space which is to be between each second drain. The ground on which they are laid can thus be kept sound. The drains, at least in upland clay, can be cut cheaper at a time when it would be unsafe to cart on it. The earth from the drains is to be thrown to the side opposite to that on which the stones are laid. They may then be filled either with a shovel, or a harp screen invented by me, of which the following is a description:—It is mounted on wheels, so as to enable it to run sideways along the drain. It has two gratings of different sizes. The smaller is placed underneath, the stones are thrown on it from behind, the larger ones run off it into the drain, the smaller fall from the under grating and board laid on the side of the drain, the machine is pushed forward, the larger stones are levelled, the smaller put on as blinding, and the board, of which three are required, carried forward by a boy. This machine has the advantage of saving a considerable quantity of small stones which would pass through a common screen, and which, if caught by a riddle and mixed with the larger, would fill the crevices. Two men

and a boy fill thirty-six carts per day. Wages, 4s. 6d., or 1½d. per cart.

The expense of returning the earth to the drains, as formerly described, is nearly the same in all cases. If this screen is not used, it is necessary to put on a *flaucht* or *divot*, or thin turf, which is an offset to carting the sand, which I have found to occupy more than a foot per yard.

The expense of three different modes of filling drains will stand thus per chain.

No. 1.—With broken stones where the screen is used.

Cutting,	.	.	.	.	.	L.0	1	2
47 cubic feet of stones at 9d. per yard,	.	.	.	.	.	0	1	3½
2 carts filling, carting, and emptying,	.	.	.	.	.	0	0	6½
2 carts filling into drain with screen,	.	.	.	.	.	0	0	3
Returning earth with plough,	.	.	.	.	.	0	0	1½
						<hr/>		
						L.0	3	4¾

No. 2.—With broken stones riddled at the bin.

Cutting,	.	.	.	.	.	L.0	1	2
47 cubic feet of stones at 9d. per yard,	.	.	.	.	.	0	1	3½
2 carts riddling, filling, carting, and putting into drain,	.	.	.	.	.	0	0	10½
Putting on flauchter-turf, and returning earth,	.	.	.	.	.	0	0	1½
						<hr/>		
						L.0	3	5½

The charge for carting should be greater if the horses or fillers are not fully occupied.

No. 3.—With tiles and soles.

Cutting,	.	.	.	.	.	L.0	1	2
57 tiles and soles, and carting,	.	.	.	.	.	0	2	9½
Returning earth,	.	.	.	.	.	0	0	1½
Throwing in furrow slice from between drains,	.	.	.	.	.	0	0	6½
						<hr/>		
						L.0	4	1½

The expense of these different modes of draining will stand thus per imperial acre.

Distance between the drains in feet.	Number of chains per acre.	Expense per Imperial Acre.		
		No. 1.	No. 2.	No. 3.
14	47.14	£7 18 4	8 2 5½	£9 13 5½
16	41.25	6 18 6½	7 2 1½	8 9 3½
18	36.66	6 3 1	6 6 3	7 10 6
20	33.	5 10 10	5 13 8½	6 15 5½

ON TILE DRAINING. *By Mr JAMES WILSON, Erskine, near Glasgow.*

[The Honorary Silver Medal was awarded for this Essay.]

HAVING fixed on the proper sites for main and common drains,* operations may commence by laying down tiles at the line of drains. The submain should first be opened; if it is necessary to have more than one outlet or mouth, that next the highest side of the field may be taken first, and opened so far as will embrace all those falling into it: in this way, that part may be finished, which will not require more main to be opened and exposed to accidents, than what is necessary. If this drain is intended to be executed with stones, it must be from 20 inches to 2 feet wide at the bottom, in order to give room for a sufficient built conduit; if with tiles, 7 or 8 inches wide at the bottom will serve. The main should always be from 4 to 6 inches deeper than the common ones, that there may be a fall into it, which will prevent a lodgement of sediment at the joining.

The parallel drains should next be opened. If the field

* The sites described by the author are the same as those already described in the first essay.—Ed.

has been pastured and the sward tough, it may be pared off about 2 inches thick from where the drain is to be, and laid aside, in order to be used as a covering over the tiles. Then with a common spade, the vegetable soil, if light and porous, is to be taken out and laid close to the edge of the drain, that it may be returned next the tiles. All the bad tilly clay is then taken out with tapering spades to fit the drain, and laid beyond the vegetable soil, that it may be scattered along the surface of the field. When thus opened, a cross section of the drain will appear as in Fig. 8, Plate V, where *b* is the tile brought to hand; *a*, the sole; *c*, the vegetable or good soil; and *d*, the tilly-clay.

At this stage, the work should be inspected by the person having the superintendence, as to being neatly cut of the specified dimensions, the bottom well cleared out, the descent uniform, having no dead pools or rapids. If no objections of this kind appear, the tiles may be laid, beginning at the highest end of the drain, the workman standing in it and moving backwards as the work progresses, first laying the soles, observing that they are firmly bedded, then placing the tiles on them, in such a way that the centre of the tile may be over the seam between the soles, and *vice versa* as in the annexed figure.



Then the turf is folded neatly over them with the green side downward; which ought always to be at hand, that the whole may be finished in going along. If there is water in the drain, it will be necessary to provide a hoe that will fit the bottom, in order to draw along any sludge that may accumulate, and have it thrown out before placing the tiles. In finishing at the joinings, it will be proper (if the main is to be done with

tiles) to slope the bottom gently down to the receiving-drain, that the junction may be complete.

Having the tiles laid and turfed, a little of the vegetable mould may be thrown in, and slightly pressed down with the foot, in order to secure the tiles in their places ; this operation will require some caution, in case of shifting them off the soles.

The submain should now be laid and covered in, as far as the others are finished. If with tiles, the work will proceed the same as with the others, only at the junction with the common drains, a tile having an opening in the side, should be placed to admit the water from them, and the joint made secure by packing a few small stones round it, and covering the whole firmly with a good turf. If stones are used, a built conduit will be necessary, with openings left opposite each of the common drains. A conduit of 6 inches wide by 9 inches high will discharge a considerable body of water ; but the size must depend on the quantity likely to flow. A few stones should always be built round the mouth to secure it. Then the remainder of the vegetable soil is thrown into the trench, pressing it down a little with the foot. If the good soil thrown out is not sufficient to fill the drain, it may be taken from the sides either with the spade or plough ; if the latter is used, care must be taken to prevent the horses walking on the drain, as they are apt to sink and endanger the tiles. It is not easy to say exactly how long the soil will take to consolidate in the drain ; this will depend greatly on its nature, and the season of the year that the drains are executed ; gravelly and sandy soils will soon consolidate, clay and loam will take longer time, and in summer the consolidation is not so rapid as in winter ; but, if possible, no heavy cattle should be allowed to travel on them for one year after they are made.

Tile drains will act with very little fall ; 1 foot of fall to every 1000 feet in length will be perfectly safe, but it is best to have 1 foot of fall to every 300 feet of drain. If the de-

scent is greater than 1 foot in 3, the drains should be carried in a slanting direction across the slope.

Having thus endeavoured to describe generally the manner of executing tile drains, we now come to consider them as more particularly adapted to the different varieties of soil. Without entering on a more minute division, it is hoped the following simple classification will be sufficient for the present purpose, viz. :

- | | |
|----|---|
| 1. | Tile-drains as applicable to loamy or alluvial soils. |
| 2. | gravelly soils. |
| 3. | sandy soils. |
| 4. | clayey soils. |
| 5. | peaty soils. |

1. *Loamy or alluvial soils*, if uniform to some depth, are generally of a texture sufficiently porous to allow surface-water to escape where the descent is good. Very often such soils are injured by a breaking out of under-water, which, of course, will require pretty deep drains to cure it. But where there is a want of fall or interruptions in the descent,—as on the banks of streams liable to be occasionally overflowed, or in hollows when the water is kept back,—tile-drains, on the common principle for surface-water, may be successfully applied. The most important object in all such cases is, a sufficient level or fall for an outlet. This is sometimes difficult to procure on the banks of streams: the best way is, to go down a convenient distance and bring up a main drain parallel with it, entering at a very acute angle. Having provided this drain, the common ones may be carried into it at right angles, the distance between each varying from 20 to 30 feet, according to the natural descent of the ground, or its liability to be overflowed. When sufficient fall can be got, the main should be 3 feet, and the common drains $2\frac{1}{2}$ feet deep; sometimes, however, such a depth cannot be got, therefore somewhat less must satisfy. Having placed the tiles or soles

(which will be always necessary in such soils) with a turf neatly folded over them, the soils taken out may be returned into the trench. If small stones or gravel are at hand, or can be procured at a reasonable expense, 6 or 8 inches of such material above the tiles will add greatly to the efficiency as well as permanency of the whole.

2. *Gravelly soils*, when not incumbent on an impervious substratum, are likewise little liable to injury from surface water, but tiles will be useful in draining such soils, whether the evil proceeds from under water, or a retention from want of fall. Having provided the necessary mains and outlets, the drains may be carried across, or up the slope, as circumstances seem to warrant. When the soil is pretty open, and free of retentive matter, the drains will act to a considerable distance, say from 40 to 50 feet asunder; but when there is a mixture of clay in the gravel, the space between the drains must be proportionally diminished. A cross-drain carried along where the water first makes its appearance, will often dry a great breadth of land below it. Should the soil and stratification be so irregular that the field has the appearance of numerous wet and dry portions, the drains should be carried indiscriminately through the whole at equal distances, without regard to the different kinds of soil met with, further than a proper application of turfs and soles when necessary; by which means an uniformity of dryness will be attained. In such cases, the distance between the drains will vary from 20 to 40 feet, according as the soil is more or less pervious to water. Such, however, is the diversity of texture and circumstances connected with this class of soils, that it is difficult to specify a method that will apply to every case: this can only be obviated by a little exercise of judgment, in adopting a plan that will be most effectual as well as cheapest; but, in general, the drains should be from $2\frac{1}{2}$ to 3 feet deep. The tiles may be laid without soles, where the bottom is sufficiently

firm and not likely to be cut by the current of water, and the open gravelly soil, when free of clay, may be returned into the trench.

3. *Sandy Soils*.—What has been already said regarding soils of a gravelly nature, will likewise apply to soils for the most part composed of sand. Only, where the sand is apt to slip or run, whether mixed with clay or not, some precautions will be requisite in order to prevent the smaller particles from entering and closing up the orifice. For this purpose the drain should be made a little wider in the bottom than is usual, in order to receive a turf, which should be placed with the green side up, on which the soles and tiles are placed, with a thin turf folded neatly over them; the water will thus be filtered to the passage afforded by the tiles, and by keeping back the sand a permanent drainage will be insured. It has been matter of very general complaint that tiles do not continue to afford an opening among sand. We can, however, with confidence recommend the above method, which, if carefully gone about with proper materials, will certainly insure success. It is necessary to be particular as to the turfs used; those off a sandy soil are bad, likewise clay, which is too impervious; the best is from moss or moorish soil when tough and matted, or any old well-matted turf off a light friable loam or vegetable soil.

4. *Clayey Soils*.—By far the greatest proportion of arable land benefited by tile-drains belongs to this class of soils. It may be proper to divide them into two varieties, viz. soils of a light friable nature, incumbent on clay or till, and heavy clay soils, also incumbent on an impervious mass of strong clay.

1st, Light friable soils incumbent on clay or till (which is poor clay and gravel uniformly mixed, and very firmly con-

solidated) are seldom very deep, in consequence of which and the impervious nature of the subsoil, they are constantly liable to saturation from rain water, which having no way of escape but by evaporation in the atmosphere, renders it an exceedingly disagreeable and unprofitable subject for cultivation. A system of thorough drainage, aided by subsequent deep-ploughings, will improve such land amazingly in depth and quality. In applying a course of drainage, having first fixed on proper submains and outlets, the nature of the subsoil will regulate the distance between the ordinary ones. Sometimes the tilly bottom is slowly pervious to water, from having very thin laminæ of pure sand irregularly interspersed through it. Where that is the case, the drains may be from 20 to 24 feet asunder. If sand is uniformly mixed with the clay, and in such proportions that the mass will slip when gorged with water, then the distance between each may vary from 16 to 20 feet, according as sand prevails. But where the subsoil is composed of an uniform mass of impervious clay or clayey till, the distance between the drains ought never to exceed 18, and from that to 12 feet. They should be 30 inches deep, or if placed in the furrows where the ridges are much raised, 24 inches. On very firm till, soles will not be necessary, as, from the mixture of small stones, the tiles will be supported in their places, nor will the water cut away the bottom; but in pure clay, or clay and sand, soles will always be required, as otherwise the tiles would sink or be sludged up. Having the tiles laid and turfed, and the light soil *only* thrown into the trench, the clay may be disposed of by spreading it across the field; it will rarely be injurious, but, being exposed to the sun and air a little, will assist in improving the lighter soil.

2d, Strong heavy clay or carse land, where both soil and subsoil is little pervious to water, will require a peculiar and somewhat more expensive method of draining in order to se-

cure permanent success. Such soils are commonly cultivated by being gathered up in pretty high ridges, in such a way that the water falling on the surface may run off and be received in the furrows, which act as so many open drains in carrying it away. The convexity of ridges necessary for this purpose is, in many cases, attended with considerable loss and inconvenience; loss, in consequence of the *active* soil being collected in a body on the crown of the ridge, leaving the furrows, and a portion of the surface on each side, so much bared of good soil, that it is comparatively steril, and the influence of the sun (so essential to the ripening process) is so partial, that the crop must suffer alike in bulk and quality. The inconvenience of labouring land where the ridges are very much raised will be apparent, by considering, that the implements used in cultivation act to much better purpose on an equal than uneven surface.

The most effectual method of obviating these evils, and obtaining an uniform and improved soil, is by placing a drain in every furrow, $2\frac{1}{2}$ feet deep, or if the ridges are very high and require to be reduced, the drains may be only 2 feet deep. The tiles must always be placed on soles, as they will otherwise sink in the clay, or the opening will be gorged up by an accumulation of soft pulpy matter rising from the bottom; they are then to be covered with a porous turf as before described, and the trench filled up with open material, such as sand, gravel, moss, or any other porous soil. The clay taken out may be scattered along the surface, or if thought hurtful carted away. If the clay is returned above the tiles, however it may admit water while the fissures created by displacing remain, yet it will shortly regain its original consolidation, and present an impervious covering over the tiles which no water can pass through; therefore the drains will be useless.

Having the drainage executed as above, the ridges may be gradually reduced, but must still retain a slight convexity,

that the water falling on the surface may readily find its way to, and be absorbed by the drains.

5. *Peaty soils* are sometimes difficult to drain thoroughly, especially if the extent is considerable; being of a spongy nature, they absorb and retain a great quantity of water, which indeed seems essential to their formation. Peat is commonly found in low or level situations, where water is likely to exist in sufficient quantity to keep the whole mass in a state of constant saturation. Very often a stratum of sand or gravel, below the body of peat, is the medium by which the water is supplied, and when it is practicable, to cut off the supply by a drain round about, and through the mass of peat into the firm subsoil, an important point is gained. But it often happens that the depth is such that it is impossible to reach the hard bottom with a drain; then an alleviation may be attempted by tile-drains in the ordinary way: still, however, a complete and permanent drainage can scarcely be calculated on, chiefly on account of the highly capillary and friable properties of quick moss. The former tends to keep it always in a state of moisture by attracting water from below; and the latter is apt to destroy the drains, as the water enters them highly impregnated with the peat in a state of solution, which by and by forms a pulp, and, if the descent is not pretty rapid, settles in the bottom, and in time gathers consistency sufficient to shut up the passage.

To guard against so great an evil, the tiles should be placed on soles that will prevent them sinking individually in soft places. Wood is well suited for this purpose, as the slabs or planks may be of some length, so that each piece may support several tiles, which will keep the line of bottom in an uniform position; then, in order that the water may enter the drain free of impurities, a thin well-matted turf should be folded closely over the tiles: if a few inches of sand or small gravel is added, a complete filter will be obtained, and where the de-

scent is sufficient to carry the water freely off, the drain will last a long time. But it is very rare that a good fall is obtained in peaty soils ; in all cases where the level is dead, a deposit of sediment is very apt to take place. There is one advantage attending tiles over any other material commonly used in draining moss-land, which is, that the drains may be reopened and cleaned out, and the tiles replaced at a moderate expense.

With regard to the comparative advantages and disadvantages in using tiles or stones in the execution of drains, it may be remarked, that the facility of procuring either the one or the other, and their relative cost, will naturally have considerable influence on their being adopted. There are cases, however, where a selection is proper, as in sandy soils and quick moss, tiles are preferable, for reasons already stated, and when the cartage of stones is difficult or injurious to the land. When stones are used, they are commonly broken to the size of road metal, or to pass through a ring $2\frac{1}{2}$ inches diameter, the drains being about $2\frac{1}{2}$ or 3 feet deep, 12 or 14 inches wide at the surface, and 4 inches wide at the bottom. Filled up 12 or 15 inches with broken stones, they thus afford a considerable area for water to enter at the sides, and on steep descents the bottom is not liable to be cut by the current, as the water percolates slowly through the interstices. When sandstone is abundant, the drains may be executed at somewhat less expense than with tiles ; but if the cartage is considerable, or the stones difficult to break, the expense will be much the same. As to effect, if the tile-drains are carefully executed as before pointed out, they will be found in every respect equal, if not superior, to the best stone drains.

REPORT ON THE NATIVE PINE FORESTS OF SCOTLAND. *By*
Mr JOHN GRIGOR, Nursery and Seedsman, Forres.

[The Society's Silver Medal was awarded for this Report.]

Abernethy Pine Forest.—This forest is the property of the Earl of Seafield. It is one of the most ancient forests in Scotland, and for time immemorial has been famed for the quality of its pine timber. It stands on the southern extremity of Morayshire, on the south side of the Spey. The water of Nethy winds through it, and is of the greatest importance to the forest, as it supplies water-power to the saw-mills, and floats the timber to the Spey, by which it is conveyed to the seaport of Garmouth. The timber of this forest contains a large quantity of resin, and is therefore very inflammable. In the year 1746 a great proportion of it was burned down, but a large extent has produced a new crop of excellent timber. The ground on which the forest stands is partly hilly and partly level; the smaller hills, and the sides of the larger, to a considerable extent, being entirely covered with trees. The soil is of various qualities, but is principally composed of a thin sandy moss, with a subsoil of hard hazelly-coloured gravel, and, in some parts, it is a black mould, mixed with white sand, and very stony.

Along the banks of the Nethy I had an opportunity of seeing a great quantity of very fine timber, barked and prepared for floating; the largest of which measured 10 feet 7 inches in length, 6 in girth at the root end, and 5 feet 2 inches at the other end. The number of annual layers or rings at the root end indicated its age to be seventy-three years, and that at the upper end sixty-one years. The timber was of excellent quality, well hearted, clean, and full of resin, and although from 32 to 34 of the last formed rings composed the sapwood, yet it bore a comparatively small proportion to the bulk of the whole trunk, the trees having, of late years, made but little progress.

Many of the trees were much older and smaller, consequently their wood was closer, and of superior quality.

I was directed to that part of the forest called Reynloit, which stands about seven miles south of the Spey, as affording the best specimens of large trees, many of which I measured, close above the swell of the roots, or about the height of one foot from the surface, at which the largest were from 10 to upwards of 13 feet in circumference, and at the height of 8 feet from the ground from 9 to 12 feet, tapering with a clean trunk to the height of from 20 to 35 feet, and shooting up to the entire height of from 40 to 65 feet. These very old trees stand on low and level ground, on the side of the Nethy; but perhaps the finest tree in this forest stands on a steep hill-side adjoining, though not highly situated, which measures in circumference, at the height of 1 foot from the surface, 13 feet 3 inches, and at 8 feet high 12 feet. It tapers to 32 feet of trunk, its whole height being about 50 feet, with a top branching like an oak, to which all the large trees in point of form bear a strong resemblance. A few yards distant from this tree, one of similar dimensions had lately been felled; the stump and roots remaining to indicate its size. The annual rings of this root indicate the age of 242 years, and that of the top 224. The top lay at the distance of 27 feet from the root, and I imagine that the tree had grown about that length in eighteen years, that being the number of years intervening between the ages of the root and top. Several others had been felled of nearly the same size, which had almost attained the age of 200 years. I observed from the size of the interior layers, that the trees had rapidly advanced in growth between the age of 8 and 70, the growth having afterwards diminished, and eventually the outside layers, although distinct enough to be numbered, are very minute, and the whole timber is equally strong, hard, and red, to within less than an inch of the bark. Many of them had been thrown down by the great flood of 1829; the stumps of which still remain, and shew

that the roots had derived all their nourishment from the surface soil, none of them being more than one foot from the surface, where the subsoil is hard and gravelly. They are discernible above ground, and each forms a rib, to the height of several feet on the side of the trunk. The soil on which these large trees have been produced is sandy moss, to the depth of from 4 to 8 inches, lying for the most part on a brown gravel of several yards in depth. And in some parts the subsoil is more fertile, and of a blackish colour, with a mixture of large stones. These soils produce only the following small variety of plants. *Calluna vulgaris*, *Vaccinium vitis-idaea*, *V. myrtillus*, *Hypochaeris radicata*, *Blechnum boreale*, and a species of *Scirpus*.

Duthel Pine Forests.—These are all the property of the Earl of Seafield. They stand on the north of the Spey, to the west of Abernethy, and are situated on sloping ground, similar to the latter. The best trees grow in the lowest grounds, and on slopes embosomed in large mountains. The timber of these forests is extremely fine and durable. The river Dulnain ornaments these glens, floats the timber, and impels saw-machinery. On examining some newly cut timber which grew near the base of the hills, the largest I found measured in circumference $8\frac{1}{2}$ feet at the root, and 6 feet 10 inches at 6 feet high, and gradually tapered, with a straight stem, to the height of 36 feet, at which point it was 3 feet in girth. Its age was 118 years. During the first five years it had grown very slowly, but afterwards rapidly; and at the age of forty it had been 14 inches in diameter. The chip of the sapwood was only $2\frac{1}{8}$ inches in thickness. The surface soil, where this tree stood, consists of a thin moss, on a subsoil of rich brown mould. The herbage consists of but few varieties of plants, viz. *Calluna vulgaris*, *Vaccinium vitis-idaea*, and *Juniperus communis*.

On advancing to ground elevated about 200 feet higher than that already described, we found the trees much smaller,

more crowded, considerably taller, and closer in texture, though not more resinous. Many of the largest trees in this quarter have been lately felled, and the oldest measured $4\frac{1}{2}$ feet in circumference at 1 foot from the surface, and nearly the same at the height of 20 feet, tapering to a small bushy top to the height of from 65 to 70 feet. On examining several trees of equal size lately felled, I found their age to vary from 112 to 126 years, and the thickness of sapwood does not in general exceed 1 inch. The herbage is the same as that found on the lower ground already described, but the soil is a red clay, with large rocks of granite projecting above the surface, forming very dissimilar ground to that which is generally considered best adapted for pine; and although some parts of it are very steep, forming an angle of 45 degrees, yet the ground in general is moist, and occasionally the water is seen flowing from the higher ground. Seldom can a young plant be seen coming up near the remains of the old trees, but extensive masses of them are rising along the borders of the forests. The herbage associated with the rising plants is principally common heath, or *Calluna vulgaris*, I also found *Tormentilla officinalis*, *Vaccinium myrtillus*, *Melampyrum pratense*.

Rothiemurchus Forest.—This is the property of Sir John Peter Grant. The old forest of this place is much exhausted, but many beautiful clumps of pines still remain, to support the reputation for timber which this district has so long and justly maintained.

The pines here are not so remarkable for their girth as for their extraordinarily tall and smooth trunks. Many patches of them are still growing, and the trees almost stand of an uniform size, measuring at 6 feet high $4\frac{1}{2}$ feet in circumference, and nearly of the same girth to the height of about 35 feet. Their entire height averaged about 70 feet, and many are even much higher.

In many parts I found roots of trees which had been recently

felled, similar in dimensions to those described. On these the annual layers of wood numbered from 120 to 125. These roots indicate that there had been a great growth at the age of from twenty to thirty; latterly the growths are small, and the sap-wood, in consequence, is very narrow. The largest tree I found in this forest measured $9\frac{1}{2}$ feet in girth, at one foot from the surface; at the height of ten feet it measured $7\frac{1}{2}$ feet; and its first lateral branch is at the height of 30 feet;—in all about 50 feet high. An adjacent root, of rather less size, shewed the age of 130 years, and a diameter of 1 foot, at the age of forty-eight.

The surface of this forest is very unequal, being in a great measure composed of small abrupt hillocks. The hollows are for the most part marshy, with a peat or mossy surface. Although some of the hollows are now too wet for pine, they are crowded with roots of trees, which demonstrate that they had once yielded timber, though apparently of no great size. In these marshes we observed several acres covered with the *Nymphæa alba*, *Ranunculus flammula*, *Glyceria fluitans*.

A stranger to these Highland forests cannot but be surprised at the closeness of the trunks to each other, and must admire the value of the timber contained in so small a space.

The best of the timber stands on knolls, and grows so closely, that the surface is rendered destitute of herbage, and the largest trees are found on the outskirts. On the open banks, near the marshes, young natural pines are growing extensively among *Erica cinerea*, *Calluna vulgaris*, *Vaccinium myrtillus*, *Melampyrum pratense*, and *Aira flexuosa*.

Although, during the summer of 1836, Scotch firs have grown less than their usual average length, I here found one tree, the top growth of which measured 18 inches in length, which appeared to be the fifteenth growth the tree has produced. The ordinary height in this quarter of fifteen-year-old firs is $9\frac{1}{2}$ feet.

The subsoil on which the old and young forests stand, is generally dry and sandy.

Glenmore Forest is the property of His Grace the Duke of Richmond.

“The land of the mountain and flood,
Where the pine of the forest for ages hath stood ;
Where the eagle comes forth on the wings of the storm ;
And her young ones are rocked on the high Cairngor'm.”

About fifty years ago, the forest of Glenmore was considered the finest in this country. His Grace the Duke of Gordon, about that time, sold the principal part of the timber to Mr Osbourne, an eminent wood-merchant in Hull, who finished felling it in the year 1804. The timber was floated to Speymouth, and principally employed in naval purposes. One of the finest frigates built there of this timber for his Majesty's service was named “The Glenmore.”

This forest is situated in a glen, and surrounds Lochmorlich, where the water of *Abernethy*, the Druie, takes its rise, close on the north-west of the mountain of Cairngorum. Its length is upwards of four and its breadth nearly three miles. There are still a great many fine trees here, particularly on the borders of the lake, but none are notable for great dimensions except a few, measuring from 9 to 10 feet in circumference, of little value, being knotty, bushy, and blemished. They stand at great distances, commonly from 50 to 100 yards apart, and evidently have not been considered of consequence, when the intermediate ones had been felled. In other parts they are in patches, on the border of the lake, and on hill-sides ; in both situations they grow rugged in figure, and of great girth.

Notwithstanding the openness of this situation, and the fertility of the soil, it seems not to be congenial to the natural reproduction of pine timber ; for, in the interior of the forest, a young plant is rarely met with. On examining this place, a flat of ground, at a turn of a small rivulet, was pointed out as the spot where the largest trees grew, one of which was called “The Lady of the Glen,” the largest in this forest. It was

cut up, and a deal from its centre presented to his Grace the Duke of Gordon by Mr Osbourne. I have seen it in the entrance-hall of Gordon Castle, being 6 feet 2 inches long, and 5 feet 5 inches broad. The annual layers of wood, from its centre to each side, number about 235. A brass plate attached to the plank bears the following inscription:—

“In the year 1783,

“WILLIAM OSBOURNE, ESQUIRE,

“Merchant of Hull, purchased of the Duke of Gordon the forest of Glenmore, the whole of which he cut down in the space of twenty-two years, and built, during that time, at the mouth of the river Spey, where never vessel was built before, forty-seven sail of ships of upwards of 19,000 tons burthen. The largest of them of 1050 tons, and three others, little inferior in size, are now in the service of his Majesty, and the Honourable East India Company. This undertaking was completed at the expense (of labour only) of above L. 70,000. To His Grace the Duke of Gordon this plank is offered as a specimen of the growth of one of the trees in the above forest, by his Grace's most obedient Servant,

“WILLIAM OSBOURNE.

“HULL, September 26. 1806.”

Many blocks, of extraordinary size, are yet to be seen near the spot where this tree grew. The surface-soil is composed of thin sandy peat earth; the subsoil of rich brown clay, which feels quite soft, and forming a great part of the subsoil in the glen. Perhaps no district in Scotland is better calculated than this for growing larch, oak, or various kinds of valuable hardwood. The herbage consists of *Calluna vulgaris*, *Juniperus communis*, *Tormentilla officinalis*, *Polygala vulgaris*, *Agrostis vulgaris*, *Narthecium ossifragum*, *Vaccinium vitis-idaea*, *Erica Tetralix*, and *Prunella vulgaris*.

Along the outside of this forest, particularly at the west end, and on the east of Rothiemurchus forest, the young wood, to the extent of several square miles, is fast advancing. The largest of these are about thirty years old. Those I measured of that age average the height of 29 feet 6 inches, and, at the height of one foot from the ground, measured in general about 3 feet 7 inches in circumference. These trees

grow slowly until they reach the age of twelve, which, perhaps, is owing to their roots not penetrating earlier into the rich subsoil. They are of all sizes under 30 feet; some crowded, and others quite thin. This young forest is of the usual age for bearing seed, but very few cones are to be seen; and on examining the ground around the trees, few of those of former years are found, and those are smaller and rounder than the cones of the low country trees. Here, ten-year-old trees are of the average height of $5\frac{1}{2}$ feet. The herbage is—*Calluna vulgaris*, *Vaccinium myrtillus*, *V. vitis-idaea*, *Erica Tetralix*, *Tormentilla officinalis*, and *Juniperus communis*.

On the hill Crawgowrie, standing between Glenmore forest and the Spey, there are many large and thriving pines; the root of a large one, which had been lately cut down, indicated the age of eighty-three, and the block measured 9 feet round. The wood appeared to have been well-hearted and resinous, although some of the layers were $\frac{1}{2}$ of an inch in breadth. It stood on a subsoil similar to that of Glenmore, covered with common heath, fern, and juniper.

Plantations at Castle Grant. — Within a few yards of Castle Grant some very fine planted Scotch firs are growing, which measure, at the height of 1 foot, 9 feet 8 inches, and from 20 to 30 feet, they divide into branches and their entire height is from 60 to 70 feet. In the same plantation an oak, at the height of 6 feet, measures 8 feet 9 inches; an ash at the same height measures 8 feet 6 inches, and a sycamore 8 feet 8 inches. There are also Lime, Beech, and Elm trees, but none so large as those described. The plantation stands on an inclined surface of black rich earth, with a subsoil of moist gravelly sand, covered with herbage consisting of *Veronica officinalis*, *Hieracium paludosum*, *Aira cæspitosa*, *Tormentilla officinalis*, *Prunella vulgaris*, *Galium saxatile*, *Ranunculus acris*, *Anemone nemorosa*, *Cnicus palustris*, *Hypochaeris radicata*, *Agrostis vulgaris*, and *Melampyrum pra-*

tense. I had not an opportunity of ascertaining the age of the trees in this plantation.

- In these Highland forests the soil is found of very different quahtics, which, in some measure, regulates the quality of the timber. The richest ground produces the largest trees, consequently the timber is not so fine in the grain as that grown on sand or poor gravel; but the quick grown trees appear as full of resin, as healthy, stands to as great an age, and as red when cut up, as those which grow on poor soil. In general the soil of the native Highland forests is superior to that on which firs are commonly planted throughout the low country. Neither poor soil nor bad climate can account for the superiority of the Highland pine, as the forests are generally situated in glens or in the most sheltered slopes of the hills.

Natural birch and alder are frequently met with in these forests, but none are large or valuable; the latter not being confined, as might be supposed, to the lowest grounds, but are frequently found at considerable heights on the hills. It is very rare to see any other trees in the vicinity of these forests; but I observed an ash standing alone and much exposed on the western extremity of the parish of Inverallen, and on the north of the Spey, opposite Abernethy. Perhaps another hardwood tree is not to be found within a mile of this one. At 1 foot from the surface it measures 20 feet 9 inches in circumference; at the height of 8 feet, it measures 14 feet 10 inches; at the height of 13 feet, it is divided into five limbs, and its whole height is about 60 feet, several of its large branches having been blown down. The trunk is hollow in the centre, but its leaves have a healthy appearance. The surface of the ground where it stands is rendered fertile from its decayed foliage, and by the tree affording a shelter for sheep which pasture on the surrounding heath. The subsoil is of a sandy clay inferior to the generality of the subsoil in Duthel and Glenmore.

The quality of soil in the Highlands seems, in no degree,

to alter the external appearance and figure of the pines. Under every circumstance, they assume a rough and shaggy form. In general they are older than most plantations throughout Scotland, and are of greater size, even in proportion to their age. Notwithstanding this, it is very uncommon to see a single tree in a decaying state. We observed several trunks that had a few feet of timber scooped out from the side of each to be used as *candles* by the cotters, yet the trees continue quite green and healthy, with the hollows overhung with turpentine icicles several inches in length.

The pines grown in these districts appear to be of one species, and differ from the great bulk of those produced in the low counties of Scotland in the following respects:—

The Highland Pine is of a more robust and shaggy appearance. In early life it grows, although crowded together, to a greater girth; it is found to attain a greater size, on very wet ground; its wood is redder and harder, consequently more durable, and is found to be more inflammable. It produces very few fertile flowers or cones, and what it does produce, are uniformly found to be rounder, smaller, and whiter, and it outlives many generations of the common cultivated fir, and ultimately attains a larger size.

It may be difficult to ascertain the differences in plants necessary to constitute a distinct species, but if the superiority of the Highland pines to the common tree of the low country should not be attributed to a difference in kind, the great proportion of the trees in Scotland, by repeated cultivation, must have lamentably degenerated, since it is known that thousands of the common fir have arrived at maturity and thousands have died of old age, without ever producing timber in any respect comparable to those of the districts now attempted to be described, and they who aim not to propagate these magnificent objects of nature, overlook that analogy which is everywhere observable in the works of creation.

FLIES AND OTHER INSECTS HURTFUL TO LIVE STOCK, &c.—
By the Rev. Dr SINGER, Kirkpatrick-Juxta, Dumfriesshire.

SINCE the dry season 1826, the blue flesh-fly, *Musca vomitoria*, and the green flesh-fly, *Musca cadaverina*, have been more hurtful to sheep in warm weather, and after having struck, it is not long till they kill if not prevented. To pick off the maggots, and dust with quicklime in flour, prevents the loss of sheep, and does not discolour the wool. Pouring with tobacco liquor is fatal to these insects, and also to the ked, *Hippobosca ovina*, and to the tick, *Acarus reduvius*, if it fairly reach them. Tar and train oil may be necessary to remain on the parts if wounded. Removal to higher and cooler grounds not liable to insects may be very useful. The midge, *Culex pulicaris*, about the heads of sheep and their breasts, annoy them considerably at times.

Black cattle and horses are terrified and hurt by the horse-fly, *Tabanus bovinus*, with greenish eyes, and by other species of this genus, especially the *Tabanus pluvialis*. It really seems unaccountable that movable sheds for pasturing cattle and horses are so seldom provided for their protection, as the terror and fatigue of one hour does more harm to them than any benefit they may have got by a day's feeding.

If the jumper, *Musca putris*, make its way into cheese or hams the larvæ do much harm, rendering these provisions almost useless. In looking over hams by a clear candle, the disturbed fly darts into the flame and is burnt. Any opening about the margin of a cheese admits this sort of fly, if it have access to the cheese room. The mite, *Acarus siro*, is found at the bottom of a glazed or japanned cheese-holder and should be removed, washing the parts of the cheese with spirits or port wine. Heath-burning is necessary on soils where ticks breed.

ACCOUNT OF THE IMPROVEMENT OF THE SLDGY WARD, A
FIELD SITUATED ON THE BANKS OF THE RIVER YTHAN,
WITH A DESCRIPTION OF A SELF-ACTING TIDE-SLUICE
USED IN ITS EMBANKMENT. *By the Rev. GEORGE CRU-*
DEN, Logie Buchan, by Ellon.

THE improvement of this small field deserves notice, not from its own extent, but from the peculiar difficulties that were to overcome, and from its affording a specimen of what might be accomplished in larger tracts of land similarly situated. It contains not quite three acres, and is enclosed by a stone fence on the E. W. and S. sides, and by the river *Ythan* on the N. About two acres of it next the river consists of flat alluvial land ; the remaining part rises with a considerable acclivity to the S.W., and consists of a rich loam, mostly on a gravelly, but partly on an impervious clay bottom. It has derived its name from the sedges and other aquatic plants which the superabundance of moisture produced in it when in its natural state. The river, though here about three miles from the sea, rises at spring-tides five or six feet above summer water mark, and two or three feet above the level of the field, being wont to overflow it at such times to a considerable extent on the N.E, as marked by the dotted line *a, a*, on the plan, Fig. 9, Plate V. A streamlet running down the east side, when swollen with the winter rains, sometimes encroached on it also ; and a number of copious springs on the south and west made their appearance in different places, but particularly in the angle where the sloping ground meets the horizontal. Thus was this little field infested on all sides with water, which was retained in some spots from their being below the level of the river's bank.

Considerable labour and expense had been bestowed both by the former tenant and myself in embanking, ditching, and other means of reclaiming this watery *ward* ; but our endeavours, although by no means fruitless, had failed of complete

success, partly from their being partial and not embracing the whole field, but chiefly from our not having discovered the means of letting out the fresh water from the inside of it, without admitting the brackish water from the outside.

Having in some favourable seasons experienced the productiveness of this field, but, having suffered materially from its wetness when I last laid it down in grass, I resolved to make a new effort, to dry it completely before breaking it up this spring. With this view,

1. I repaired the embankment along the river side, making it from 3 to 5 feet thick at the bottom, and raising it from $1\frac{1}{2}$ to 4 feet above the natural level of the field, and 8 feet above the lowest water-mark, which is half a foot higher than the river rose during the floods of August 1829.

2. I extended the embankment at the same height round the N. E. corner of the field, and 140 yards along its east side, at the distance of four feet from the stone fence, through which, though faced with turf on the outside, the river was wont to penetrate at high tides.

3. In carrying the embankment round the north-east corner, I left a vacant space of thirty square ells in that angle for a *reservoir*, to which even the flat part of the field had a gentle inclination. The reservoir is enlarged by connecting it with the vacancy between the east stone fence and the prolonged embankment, by a wooden pipe four inches by three, through a small turf dyke.

4. As the field did not receive more injury from the river and tide on the north and north-east than from the springs of water which issued from the higher ground on the south and south-west, in order to catch these, I cut some drains of the requisite depth (from three to five feet), *one* close by the inside of the west fence, and the others in an oblique direction across the south end of the field running into the former, as represented by the dotted lines *bb*. Having by this means obtained a considerable current of water, I carried it down

by the foot of the west fence towards the river, and continued it in a shallow open *run* along the inside of the embankment (where it catches any water that may ooze through it) to the reservoir before mentioned, which it enters through a wooden pipe of the same dimensions as the other.

5. Before ploughing the field, I filled up the hollows, and, having previously laid the ridges with the greatest inclination to the north-east, I drew a deep neck-furrow between them and the foot-ridge, which I also made to communicate with the reservoir through the wooden pipe last mentioned.

6. Having thus succeeded in bringing all the spring and surface water into the reservoir, the former difficulty still remained, of letting out the fresh-water from it, without admitting the brackish. Attempts had before been made in vain to effect this by means of a movable lid loaded with lead, placed on the sloping mouth of a wooden spout planted in the embankment; and since that time I had read Mr Thom's account of the means by which he conducted the Shaws water into Greenock;* but none of his very ingenious contrivances suited my double purpose. Happily the method delineated in Figs. 10. and 11. Plate V. (by a self-acting tide sluice) occurred to me, which I planted in the embankment within the reservoir, at a sufficient depth, and of a sufficient size, to carry off the water collected in it; and I am happy to say it has completely answered its purpose. Being simple, cheap, and effectual, it may be useful in land similarly situated, of which there are about 100 acres in this very neighbourhood. No water, as far as I know, has penetrated hitherto, and as an evidence of its beneficial effects, I have this year (1836), notwithstanding the wetness of the season, reaped and stacked 107 threaves (of 24 sheaves each) of luxuriant potato-oats from it, whereas I had only 87½ threaves in 1833, when it was laid down in grass;

* This method of constructing tide sluices is well known both in this country and abroad, and, when properly executed, is quite effective.—Ed.

and as the ground is now so dry that it can be thoroughly cleaned, I expect still farther benefit in after seasons.

As to the means of preventing the inroads of moles and other vermin, my tenure of the land would scarcely justify me in being at the expense of puddling the embankment with clay or sand, but their depredations are prevented in the mean time by the open *run* along the inside of the embankment, which, on other accounts, is necessary in the circumstances of the case. I may mention that, with a view of strengthening the embankment, I planted sets of willows all along it; but the brackish water killed them all during the first year. Fortunately a reed with extensively creeping roots (*Arundo Phragmites*) grows and is extending itself along the outside of the embankment, which I think is of some service. As the agitation of the water is apt to undermine it, I have in some places faced up its foundation with stones on the outside; and it is evident that attention must be paid every year to keep the embankment in repair and the runs clear.

As to the expense, a considerable part of the work having been done by my own servants and horses, I cannot state it so accurately, but it may be estimated as follows:—

100 Yards of embankment at 4d.	.	.	L. 13	4
140 do. do. at 1d.	.	.	0	11 8
175 do. ditching at 2d.	.	.	1	9 2
190 do. open run at $\frac{1}{2}$ d.	.	.	0	7 11
12 yokings of a pair of horse at 4s.	.	.	2	8 0
6 days of a man fitting up				
drains, &c. at 1s. 8d.	.	.	0	10 0
Tide-slucce 5s. 6d., 2 pipes 2s.	.	.	0	7 6

L. 7 7 7

Reference to Figures in Plate V.

Fig. 9. *a*, The high-water mark.

b, Drains to catch the springs from the higher ground.

c, The embankment on the river.

PLATE V

Fig. 3



Fig. 2



Fig. 1



Fig. 4



Fig. 5



Fig. 11



Fig. 10

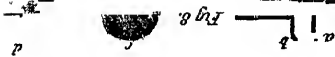


Fig. 8



Fig. 6

Fig. 7

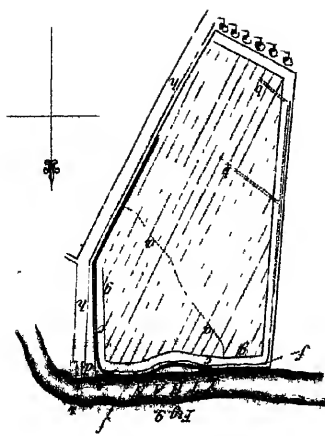
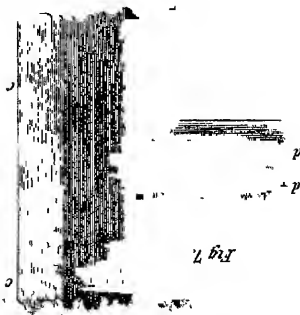


Fig. 9

Scale to Figs 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

- d*, The reservoir.
- e*, The self-acting tide-sluice.
- f*, Open water runs.
- g*, Neck furrows.
- h*, The high road leading to a ferry at *i*.

Figs. 9. and 10. Plan or bird's-eye view of tide-sluice, having the cover removed, and section of the same. In these figures the same letters apply to the corresponding parts in either figure.

- a*, the spout of the apparatus laid in the embankment, constructed of wood.
- b*, the descending nozzle of the spout in which is placed the float valve, also made of wood.
- c*, the float valve, being a hollow wooden box capable of rising and falling in the nozzle *b*, from its buoyancy in the tidal water, so as to shut or open the passage *a*.
- d*, openings for the escape of the collected water which is discharged during the recess of the tide.

NOTE.—The mode of the float's operation can be easily conceived. During the recess of the tide, the float by its own gravity, descends until its upper surface is on a level with the sole of the spout thus giving free egress to the fresh water collected in the reservoir, until the flood tide has risen so high as to envelop the float in its water. The float is then raised by its buoyancy in the tidal water, and so closes the passage through the spout *a*, preventing either the ingress of the tidal water or the egress of the drained water until the tide has again fallen below the level of the float.*

* In constructing a sluice of this kind, we apprehend that a more uniform and more permanent action would be obtained by constructing the float and the chamber in which it operates, of thin sheet copper or of sheet iron, and giving it a cylindrical instead of a cubical form.—ED.

DESCRIPTION OF MR BEART'S PATENT MACHINE FOR MAKING
DRAIN-TILES.

THE patent machine referred to in last number of the Transactions, as being successfully employed by Mr Beart of Godmanchester, for making drain-tile, has now been fully described and figured by the inventor, and from these data the following remarks and figures have been selected.

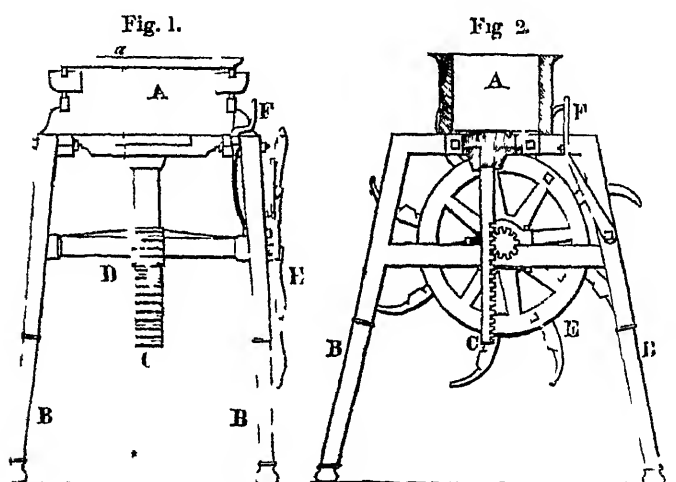


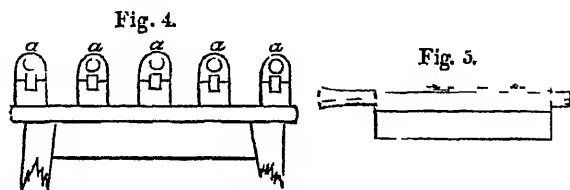
Fig. 1. is an end view of the machine, and Fig. 2. a section on the line *a a*. In these figures, the letters refer to the corresponding parts in both figures. A is a box or mould of cast-iron fixed by hook joints at the corners, and bolted to the frame B also of cast-iron. The box is $13\frac{1}{2}$ inches long, 10 inches wide, and 6 inches deep, but may be varied in

size, according to the size of tile wanted. It is fitted with a movable bottom or piston, which, being attached to the rack-bar C, rises and falls with it. The rack-bar is acted upon by a pinion fixed in the shaft D, supported in the frame-work. This shaft D carries also a spoke-wheel E, having eight bent spokes or hands, by which the operator acts upon the machine.

To work this machine properly, one man and two boys are required. The man stands on that side of the machine on which the spoke-wheel is placed, with his right hand towards the spring-stop F; one boy between the machine and the table on which the bending-blocks or horses are placed, and the other boy behind the table. The man having let down the piston to its lowest point, takes a lump of clay of sufficient size; this he throws with force into the mould; if it does not fill up all the angles, he beats it in with the blow of a mallet, and with the strike or bow, Fig. 3, cuts off any superfluous clay that may stand above the edges of the mould. He then turns the wheel E one spoke round, which, being provided with a catch on each spoke, on its arriving at the spring F, falls into, and is locked by it. By this motion the piston and clay has been raised about one inch, or the thickness of a tile; the operator then leaves hold of the spoke, and with the strike cuts off a slice of clay, equal in thickness to the space through which the piston and mass of clay has been raised; the strike being guided in passing from front to back of the mould by the edges of the same. The nearest boy now lifts off the slice, lays it upon a tile horse, or bending block, Figs. 4. and 5, where the tile is put into form by bending the slice of clay on the horse. This operation is repeated until the mould is emptied. The boy who removes the slice then moistens the inside of the mould with a wet cloth, or other wet substance; and while the man is refilling the mould, both boys are employed in washing down the bended tiles, and laying them in the drying shelves.

In making soles or flat tiles, the same process is followed, except that in this case the strike is furnished with one or two cross cutters, as shewn by the dotted marks *a, a*, in Fig. 3, which, simultaneously with the cutting of the slice, divides it into two or three separate portions. These are taken up by the boys, and removed directly to the shelves.

The table or stool that bears the horses is a very slight fabric, similar to the common moulding table, and, like it also, is furnished with a water-trough; but, unlike it in having no sand-box, that material not being required in this method of moulding tiles.



The horses, Figs. 4. and 5, are in two parts, the upper or curved part being fitted to the other by means of a groove and feather. They are covered with flannel, which, when moistened, allows the tile to part freely from them. In lifting the tile to the shelf, the upper part only of the horse is lifted with the tile. The strike, Fig. 3, is a piece of hard wood, three-fourths of an inch thick, and shaped as in the figure. A thin brass-wire is stretched between the points *b b*, which forms the cutter for slicing; and in the strike for cutting soles, the cross-cutters *a a* are added; the extremities are formed into handles, by which the operator holds the strike.

The operations effected by this machine being purely practical, it sometimes happens that the moulder succeeds but indifferently for a day or two at first; but that period will generally give him sufficient experience to enable him to turn off 3000 tiles per day.

ESSAYS ON THE PRUNING OF FOREST TREES BY THE FOLLOWING WRITERS, VIZ.

1. Mr JOHN GRIGOR, Nursery and Seedsman in Forres—The Premium of Ten Sovereigns.
2. Mr ARCHIBALD GORRIE, Annat Garden, Perthshire—Society's Medal.
3. Mr GAVIN CREE, Nurseryman and Planner, Biggar—Medal.
4. Mr WILLIAM FOWLIE, Steward to Sir William Heathcote, Bart. Hursley Park, Hants—Medal.
5. Author not known.

[This digest of these papers has been prepared by William Scott, Esq. of Teviotbank, one of the Directors.]

THESE five essays all possess great merit, and are evidently written by practical men who have had much experience in the management of woods. The opinions of the authors, and the directions which they give in regard to pruning, are generally in accordance with the known principles of vegetable physiology, and supported by facts which have fallen under the observation of the authors; and what renders them more worthy of confidence, they will be found, on a careful comparison, to coincide with one another in a very remarkable degree. This coincidence is not confined to one or two points, but embraces a vast variety of particulars; the whole forming in effect one consistent and uniform system: and we are naturally led to the conclusion that this system must be a sound one, which has thus been adopted by so many experienced and intelligent men in different and distant situations, without the possibility of any previous concert or communication. Of course each writer states his opinions in his own peculiar way; and each of the essays contains valuable information on certain points not to be found in the others. But in every essential particular they agree, and perhaps all that is most necessary to be attended to on the subject may be picked out of any one of the essays.

In what follows I have endeavoured to give a connected view of all the principal points embraced in these papers; and as the best mode of doing so, I have stated the opinions of the authors *seriatim*, and as far as possible in their own words. I consider this course as best calculated to do justice both to the subject and to the authors. The reader will thus have an opportunity of comparing their views together, and forming his own judgment in a much more satisfactory way than could be done from a dry didactic statement. There are thus presented not merely certain opinions and facts, but the authorities and reasons upon which these are founded; and if I am not much deceived, the whole will be found to form a code of instructions on the subject of pruning forest trees, well worthy the attention of those who take an interest in the management and rearing of woods and plantations.

I. Whether Pruning is beneficial.

To the first question proposed by the Society, whether pruning is beneficial to timber, these writers all return an answer in the affirmative. Mr Grigor observes,—“The utility of pruning hard-wood trees is generally admitted by practical men. It is sometimes denied by those who have witnessed the bad effects of an improper system, and sometimes by theorists who, overlooking the frequent necessity of directing the growth of the trunk in the way most suitable for mechanical purposes, contend on physiological principles for bulk of wood through the agency of leaves. Although pruning in ordinary cases does not ultimately increase the bulk or weight of wood, yet trees which are *early* and *judiciously* pruned will be improved in quality, increased in their useful dimensions and ultimate value, and a greater number can be grown on a given space.”

Mr Gorrie says,—“I consider *judicious* and *early* pruning essential towards promoting the growth and value of by far the greater variety of hard-wood trees, and even of the coniferæ in exposed situations. In allowing a tree to take its natural form in an open situation, it becomes an elegant and interesting object in the landscape, and may be very desirable as contributing to embellish the lawn or park; but its value as a timber tree is much deteriorated by numerous ramifications, attracting and retaining a great proportion of the elaborated sap, which, if properly directed by judicious pruning, would go to form valuable timber in the main trunk of

the tree. In forests and close planted woods the case is different. When trees stand in masses, the tendency to form side shoots is partially checked; and in proportion to the density or openness of the mass will the clothing by side shoots be scanty and languishing, or close and vigorous."

In these opinions the other writers fully concur. The subject will be discussed more largely in the sequel.

II. *On thick planting and timely thinning.*

The effect of planting trees in masses has been mentioned. Mr Grigor observes,—“In some situations the necessity of pruning may be in a great measure obviated by thick planting and timely thinning. These means are generally most effectual in producing straight and well grown timber of every species.” Mr Gorrie remarks,—“In such cases thinning timeously prevents the necessity of excessive pruning.” Mr Cree states, that “trees thickly planted (the Scots pine, for example) are found to produce the finest and cleanest timber of the most rapid growth, and without any pruning; for the thick planting prevents the lateral branches from attaining to a large size, and thus has an effect similar to the shortening of the branches.” Mr Fowlie,—“Much may be done in thick oak woods without pruning, by carefully thinning out the worst trees, and leaving those best calculated to become fine timber; but when woods are thin, pruning, and training carefully become essential.”

Connected with this subject, Mr Grigor states, what every one must have observed who has been in the habit of attending to planted woods: “Many plantations are ruined by proprietors thinking that thinning is unnecessary, and that the trees will thin themselves, as many natural forests do. This is a mistake. In plantations the trees are generally of the same size and age. Their tops rise equal, and form a surface parallel with the ground on which they stand; therefore without relief the whole are to a certain degree injured. In natural forests the case is otherwise. There the difference in size and age is great, and the strongest prevail.”

We may here observe, that the effect of what is above recommended,—thick planting and timely thinning,—comes the nearest possible to the unassisted operation of natural causes towards the formation of straight and well grown timber. This effect depends mainly on two circumstances. First, by the trees standing close at the earlier period of their growth,

the leading shoot, which is to form the future stem, is necessarily forced straight upwards by its own natural efforts to obtain air and light; and, 2d, That being pressed upon equally on all sides, the lateral branches of the young trees are gradually checked in their growth, and finally extirpated, so as at last to leave a straight and smooth stem, free from knots and all other imperfections. Now, when we find this, which may be considered natural pruning, to produce the straightest and cleanest timber (when this is the object we have in view), ought we not, in artificial pruning, to attend to these processes of nature, and endeavour to imitate them as closely as we are able? The method of pruning, and of the management of wood generally, which is recommended in all of these essays without exception, seems to be founded upon these principles; and the reader is requested to keep this in mind, in reference to every part of the process.

III. Pruning should be begun early. Directions for pruning young plantations.

All the writers of these essays are agreed, that in order to produce the most beneficial effects, the process of pruning should be begun early, and not carried to any great extent at once, but renewed from time to time as the tree advances, until it is brought to the most perfect form its nature will admit of. On this point Mr Grigor states his opinion as follows:—"When trees in the plantation have produced three, or very thriving two years' growths, pruning should be commenced. At this period the knife is the most suitable implement, and the *top* is the principal part of the plant which requires attention. In order that only one shoot may be allowed to remain as a leader, the others next in size, if not very inferior, should be headed down, generally to about one-half the length, and all the stout lateral branches on the tree headed in the same manner. No such branches need be cut close to the stem at the first, second, or third pruning, &c. The plantation should be afterwards regularly looked over, and pruned where necessary every second year, until it is about ten years' standing, when the trees generally become very vigorous, shewing the benefit of early pruning."

Mr Cree states, that "young trees ought to be examined so early as two years after they have been planted; and if more than one leading shoot is found to exist on any of them, and if the tree be in a healthy state, the best shoot should be selected, and the next or rival one ought to be shortened to half the length of the selected one; but if it be not healthy, it should be shortened down to some healthy shoot, and by this means its health will be restored. Though the general rule is to shorten the branch likely to gain an improper ascendancy over the leading shoot, it is sometimes of advantage to shorten the leading shoot itself, and preserve the one adjacent, if stronger. If the tree be stunted, care must be taken to select a leader that is healthy," &c.

Some sensible directions to the same purpose are also given in the Essay No. 5., where it is very properly stated, that "all suckers or branches that spring from the roots which tend to make the plant more like a bush than a tree, should be taken away; also, any branch or branches that come out from the bole near the ground and turn upwards, so as to strive with the leading shoot of the plant, should be cut off, making the wound as small and smooth as possible. When the trees have been three, or, at most, four years planted, go over the hard wood, and prune off all shoots that may have sprung from the roots. It not unfrequently happens, that the old plant seems stunted or decaying, sending out a young shoot at bottom. In such cases, prefer the young shoot, and cut the old plant over quite close to the ground. Or should the plant appear decaying without sending out any shoot, cut it over at once, and let it spring afresh, as it is in vain to wait for any recovery; for the bark becomes parched and bound, which retards the circulation of sap, so that, though it live for fifty years it will never be good for any thing. I shall mention another description of young trees which should likewise be cut over, viz. all hard wood trees about ten or twelve years old, that rise but a few feet from the ground, and spread out a large head with no particular leading shoot, but sending out small shoots in the top of each branch, and by that means rapidly getting top-heavy. In the year 1830, in the latter end of March, I cut over a great number of oak, ash, and elm, plants which were then about six years planted, and during all that time had not advanced, on an average, 18 inches. The first year after they were cut, most of them sent out fine healthy, vigorous shoots, from two and a-half to three feet long, and a great many of them far above that statement."

IV.—*On the Error of Cutting away Side-Branches at once.*

All the writers agree in reprobating the common error of clearing young trees entirely of side-branches up to a certain height. Mr Grigor observes: "It is a common error in the ma-

nagement of plantations, to clear the stems of all side-branches to a certain height, at the first pruning, and afterwards to operate only on the under-branches of the tree. This tends to produce a small trunk, an irregular top, and side-branches more vigorous than the leader. When this is practised in exposed places, not one in a hundred ever becomes a large or valuable tree. Were pruning altogether abandoned, trees of fifty years standing would generally be of more value, rough and knotty as a great part of the timber would be, than those of that age subjected to such an injurious method."

Mr Cree in like manner states: "It is one great and common error, to cut off, in one year, branches to the height, perhaps, of 14 feet, from a tree not above 20 feet high. When this is done, the trees remain nearly stationary, and are often stunted to such a degree as to assume the appearance of old age. Such an excess of amputation destroys the health of the tree, by depriving it of the organs by which a sufficiency of sap is secured, to be afterwards converted into wood."

Mr Fowlie denominates his system (which is substantially the same as that recommended in all the essays) as being the "*Natural System*" to distinguish it more especially from that *unnatural* method, which, by stripping a tree to a certain height of all its branches indiscriminately, deprives it of indispensable instruments for the circulation of the sap, and its elaboration in the leaves, and arrests the growth, until nature, by great exertion, shall have reproduced a number of branches sufficient to perform these functions."

V.—Importance of Preserving One Leading Shoot.

All the writers insist specially on the necessity of encouraging the leading shoot, and checking all others which have a tendency to compete with it, so as to divide the stem into forks or clefts. Mr Cree observes: It is well known, that when the leading shoot is destroyed, the growth of the tree is greatly impaired. It is the danger of losing it which makes wise planters so careful in fencing their plantations. By increasing the number of leading shoots, the strength of the nutritious principle is rendered in a great measure ineffectual."

Mr Fowlie remarks: "In the early growth of every tree, whether it has originated as a seedling, sucker, or stemmer, a strong vertical tendency is apparent, developing itself in perfect specimens (not only in the larch and other firs, but in the beech, chestnut and all forest trees, though they assume round heads as they advance in age), under a form nearly pyramidal, but in many cases separating the tree into different upright branches or forks. To counteract this deviation from nature's own more perfect forms, and to confine to the production of *one valuable stem*,

the vegetative power which, in a forked tree, luxuriates in a multiplicity of branches with comparatively trifling effect, is a main object of the system here advocated.

"In the application of this system to practice, the forester's simple rule will be, that all branches taking a vertical direction, and thereby becoming robbers of the main leader, should be removed, or subdued as explained below, and that no branches growing horizontally should be cut off, except in those cases where, from their size or number, they produce an evident stop or falling off in the growth of the main stem, or where, from their being overhung by larger or more spreading branches, they have begun to decay."

VI.—*On the Pruning of Trees in their more Advanced State, by gradually shortening and finally removing the lower branches, and forming the top into a cone.*

The writers are agreed in opinion, that young trees should not be pruned at once close to the stem, but that the larger branches which it may be thought necessary to cut away, should be shortened first, and cut close afterwards. This, it may be remarked, will have an effect similar to what takes place in thick plantations, where the side-branches are checked by being pressed upon, at first gently, and afterwards with greater force; until, as the trees grow closer, and their lower branches are deprived of air and light, they gradually wither and die, and are finally extirpated altogether. On this subject the essayists express themselves as follows:—

Mr Grigor observes: "we do not find it necessary to shorten *all* the branches, as above described, previous to their being removed from the trunk, as every tree produces some of weaker growth, which may at once be cut close to the stem; but we recommend it in dealing with all luxuriant competing branches near the top-shoot, and in checking exuberant branches in any part of the tree; the progress of such branches being impeded in a greater or less degree, in proportion to the distance from their extremities, at which they are cut. When trees advance to 10 or 14 feet, the oldest and stoutest branches (previously shortened) may then be removed from the stem, and as the knife is found a rather inefficient implement for that purpose, the pruning saw should now be employed; observing, that, at the junction of each branch to the stem, there is a swell or bulge, and the branch should be removed close by the *outside of the swell*, at which point its diameter is not so great as at the very bottom, by which

means the wound is smaller, and consequently will be sooner healed. The roughness left by the saw should be smoothed with a knife or chisel, taking care that the bark be not much reduced. When these kinds of trees (the deciduous) are from 14 to 25 feet in height, or from twelve to twenty years of age, they generally advance very rapidly, and if not standing close in a plantation, admit of more pruning than at any other period; but under any circumstances, trees are much injured by being severely pruned. Pruning is only of much advantage when performed early in those side branches which are apt to bear too great a proportion to the leading branch, thereby modifying the tree and directing its energies gradually to the top, preserving at the same time a sufficient quantity of foliage."

Mr Cree gives the following directions:—"As deciduous trees give out an irregular tier of branches yearly, any branch should be shortened which is of greater length than the majority of those on the same tier; or, if the whole of them be too long, they must be shortened. These shortenings ought by no means to be confined to superfluous leading shoots, but include any branch which may acquire undue magnitude. In proportion to the height of the tree, the undermost branches ought to be of suitable length, so that the proper proportion and balance may be sustained, and the top present the appearance of a *regular cone*. Some pruners thin out only the strong, others only the small branches. In our opinion young trees *ought not to be altogether deprived of any of their branches*. The shortening of the branches keeps them slender, and they at the same time give out a fine healthy foliage; the leaves are three times the size they would be were the branches not shortened. By the concentration of the sap, which the shortening effects, a much greater quantity is thrown into the main stem, which makes the tree shoot up yearly several feet (instead of inches), and at the same time maintain a proportional circumference of stem."

Mr Cree goes on to say upon this subject—"When trees are 15 inches in circumference at the ground, and, as we may suppose, 18 feet high, *the pruning close to the stem* should commence. The mode of doing this is to begin by cutting off the undermost tier of branches the first year, the tier above the next year, and so on, taking away one tier in the year. No branch must be cut close except on the undermost tier; but the same process of shortening the branches must be continued, as before directed, till the trunk is considered to be of sufficient length, with a head conformable, or in proper proportion, to the length of the trunk. With trees such as the oak, beech, and others which have naturally spreading heads, care must be taken to give them something like the conformation to which they have a natural right. [At this period of growth, trees must not be forced to a height above what maintains 1 inch of circumference in the trunk to 12 inches of height. For trees that are too high in proportion to their circum-

ference are often strained in the roots by high winds, (or get what is called a *shake*), which impedes their farther growth, and is one great cause of the rot. No tree is more subject than the larch to be injured by being lifted."

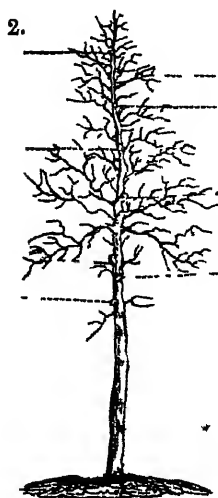
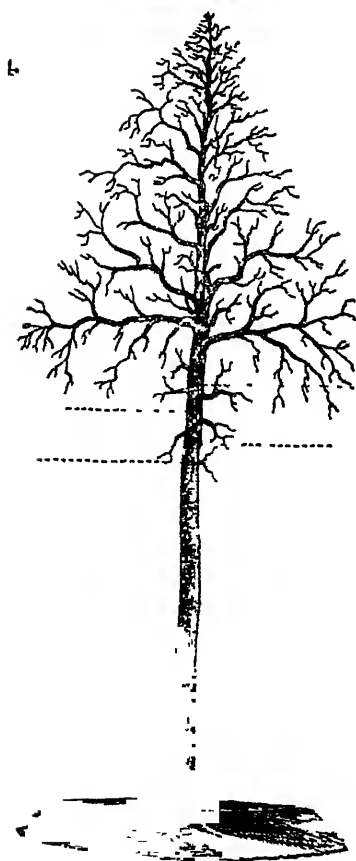
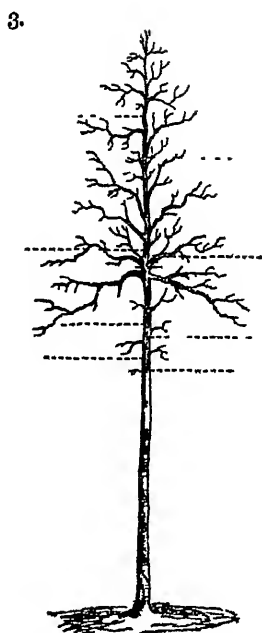
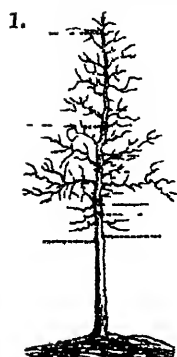
Similar directions, as to the operation of shortening the branches before they are finally cut off, are given by Mr Gorrie. He observes—"Where hedge-row trees, and trees in open situations, are intended for profitable timber, pruning should commence at an early period of their growth, encouraging the leading or main stem by displacing or shortening all over-luxuriant or aspiring side-shoots, by nipping off buds likely to contend with the leader, gradually clearing the lower part of the stem of side-shoots, and *forming the top into the shape of a very open cone*. That cone, while the trees are under ten years of age, occupying nearly half the length of the tree, and gradually diminishing from that proportion as the tree advances, till, ultimately, when about thirty years of age, the tree will have acquired sufficient length of stem, the cone or top may occupy from a third to a fourth part of the whole length. All lower branches should be removed before they exceed an inch in diameter. These remarks will apply to most part of hard-wooded trees, such as the oak, the elm, and the ash. Trees of these sorts thus managed, will form close and healthy stems, without any interior blemish, and may be trained to any reasonable altitude, according to the soil, subsoil, and situation on which they grow; but if neglected, such is the propensity of most sorts of what are called 'round headed trees,' in open spaces, to run into branches, that without due attention the foliage will become too voluminous for the roots, and a check to loftiness and the formation of useful timber will ensue."

Similar directions are given in the paper No. 5.—"The only rule to attend to is to keep the top to taper, preserving the leading shoot clear and free from clefts, and the bole free from all the largest rooted branches, leaving only those of the smaller kind that are requisite for the health and support of the tree, and clearing the tree from the bottom of all the branches as it advances in age. But the bole should be *cleared very slowly at first*, when the trees are young. Only keep the branches that are left thereon small by often pruning, so as not to injure the tree when it becomes timber. By the heads of trees being kept tapering when young, the rapidity of the growth is greatly increased, on account of the sap being confined to the most useful points, and not allowed to spread in support of large unnecessary branches. By attending to these rules, and the operation of pruning being executed every two or three years, the bole will be extended to a great height, and at the end, the grand object attained, viz., the production of sound unblemished timber."

I have quoted the above directions at more length than some may consider necessary, and even so as to incur, to some extent, the charge of repetition; but I have been influenced

by several reasons. *First*, The importance of the directions : for the method of pruning here recommended, though far from being generally understood or followed, seems obviously the best fitted for attaining the great object of rearing sound and useful timber. *Secondly*, To shew that the system so strongly recommended by so many practical men is in its great leading features precisely the same system, and that, therefore, it is the more deserving of our attention and confidence; and, *Thirdly*, because, in the minute directions given by each, such diversities occur as might be expected where practical men, without communication with each other, are following out a system founded in nature, and of which the principal points are substantially the same, shewing that its success does not depend so much on a strict attention to these minute particulars, as to keeping steadily in view the great leading principles, and the main objects for which all pruning is undertaken.

I may here refer, in illustration of the directions now given, to the annexed figures, which are portraits furnished by Mr Gorrie, of trees which have been pruned in the manner he recommends. The scale is above 8 feet to the inch. No. 1. is 12 feet high, eight years planted, with a stem 3 inches in diameter near the ground. No. 2. is 18 feet high, fourteen years planted, with a stem $4\frac{1}{2}$ inches in diameter at the base. No. 3. is 24 feet high, nineteen years planted, with a stem 6 inches in diameter a little above the ground "These portraits," he adds, "with the exception of No. 4, are of plants in hedge-rows where wood is more an object than shelter. No. 4, is from a tree standing in a plantation twenty-four years old, where attention has been paid to thinning and pruning, so as to produce the greatest quantity of valuable wood in the least time. The dotted lines point to places where prunings have been recently made, shewing the general method of pruning to preserve a proper balance of branches. Some young shoots, it will be observed, where they do not exceed the thickness of one's finger, are uniformly left immediately below the commencement of the conical top, the leaves of which assist in promoting the thickness of the stem below, and in hills and forests mingle gracefully with the topmost shoots of the underwood."



VII. *On the proportions of a tree most favourable to the growth of Timber.*

1. *Proportion of Head to Stem.*

In reference to what has been said of the gradual clearing of the stem by pruning, and forming the top into the figure of a cone, it is desirable to know what is the proportion between the stem and top, most favourable for the production of timber. In regard to this, no universal rule can be laid down, as in all cases much must depend on soil and situation. Mr Grigor is of opinion, that "in good soil, sufficiently sheltered, the trunk should be about twice the length of the top; if otherwise situated, the top may require to be as long as the trunk."

Mr Gorrie states, that in pruning young trees, "the cone or top, while they are under ten years of age, should occupy half the length of the tree, gradually diminishing as the tree advances, till ultimately, when about thirty years of age and the tree has acquired sufficient length of stem, the top may occupy from a third to a fourth part of the whole length."

Mr Cree observes, that "trees which have naturally conical heads, such as the willow, poplar, larch, silver and spruce firs, require longer heads than those trees that are of a spreading nature, as the oak, chestnut, beech, maple, ash, elm, and others." He farther states, that "in a full grown clump-headed tree, Pontey's proportion, as given in the 'Woburn beech,' is 30 feet of trunk to 22 feet of head. The proportions which he, Mr C. finds to be most consistent with full-sized trees is 50 feet of trunk to 35 feet of head." If the above is correct, the inference which appears to follow is, that in this cold country a tree requires a larger head and a greater proportion of branches to bring it to the size of large timber, than it does in the more genial soil and milder climate of England.

2. *Proportion of girth to height.* }

Mr Cree observes most truly—"It is of the utmost importance that trees should have circumference of stem in suitable proportion to their height. In young trees there should be one inch of circumference for every fifteen inches of height. If the circumference is proportionally greater, so much the better. Trees should be examined every year till they are fifteen inches in circumference; the highest will then be fully 18

feet. The examination is not a tedious process. The experienced pruner can detect the branches which require shortening by a momentary glance of his eye," &c. He afterwards states, that at a more advanced period of their growth, "trees must not be forced to a height greater than that which maintains one inch of circumference in the trunk to 12 inches of height." And in regard to a full-sized tree (such as that mentioned with 50 feet of stem and 35 feet of head), he says, "the circumference of the trunk at 4 feet from the ground should be at least 9 feet 4 inches. It will be found on observation, he states, that trees will withstand the force of the wind that have such proportions." It thus appears that, in Mr Cree's opinion, the stem should be proportionately thicker as the tree advances in age. He states that, under ten years, the tree should have 1 inch in circumference to 15 inches in height; that, as it advances to maturity, it should have an inch in circumference to 12 inches in height; and for a full-grown tree the proportions he assigns are very nearly an inch in circumference to 9 inches in height. There appears, though not stated by Mr Cree, a good reason for requiring a greater relative strength of stem in old than in young trees. Young trees bend easily, and are not much injured by the wind; they may, therefore, admit of more slender proportions. As the tree advances, it becomes more rigid in its fibres, and does not yield so readily to the blast, and therefore the stem should possess strength sufficient to resist its power; and besides, as the tree becomes older, the branches are not only larger, but by their height from the ground are apt to be more affected by the wind, and on that account the strength of the stem should be proportionately greater.

VIII. *On the evil consequences of cutting large branches.*

In what has hitherto been said of pruning, it has been recommended to begin early and proceed gradually, first shortening, and then removing double shoots and side branches while they are of small size, before the red wood begins to form, and while the wounds caused by their removal may be speedily and completely healed. When this work has been

neglected at the proper time, and the side branches allowed to grow to a large size, these are sometimes cut away close to the stem without considering the consequences. This cannot be called *pruning*, but rather *dismembering* a tree, and in many cases amounts to nothing less than vegetable murder. The evils attending this practice are admitted by all the writers of these essays, but they are most strongly pointed out in the Essay No. 5, where reference is made to facts which had fallen under the author's notice, and which are well worthy of our serious attention.

"The pruning of trees," he observes, "that have either been neglected altogether, or the work delayed until red wood has got into the branches, is generally attended with more evil than good; the wounded place is long in covering over, and in some cases is never covered at all; and the red wood having little or no *circulating sap*, or strong cementing juice, soon begins to rot and lodge the rain or damp, which in some cases wastes the trunk into the very heart. I shall mention some instances that fell within my own observation. In the year 1820, I examined a lot of trees near Livingston, in the county of Linlithgow. These trees were of different kinds, and had been pruned (that is, divested of some branches of considerable size) about ten years before they were cut down. The reason of their being pruned was, that the branches came too far out on the highway, which rendered the amputation of them quite necessary. I went and examined them after they were cut, and I found that not one of them was sound, where the branches had been taken off. I also took notice who were the purchasers at the roup, and on inquiry they informed me, that, as I had previously suspected, wherever the large branches were taken off, even although the wounds were covered over, they were rotten into the very heart. I shall state another case regarding a lot of old ash trees, that grew round a barn-yard, and had been pruned in order to give air to the stacks. These trees were also cut down and sold about fifteen years after this operation; and the consequence was, that scarcely a foot of sound timber was found in them. Another case fell under my notice in the year 1833. A cart-wright had bought a lot of Huntingdon willows, which were perfectly sound to all outward appearance, and were a lot of the finest willows I ever saw. These trees had been pruned about eight years before they were cut down, and large branches taken off. When these willows were cut up there was hardly a sound plank in the whole lot." Various other cases are stated, proving to demonstration that where large branches are cut off at once close to the stem, the tree, instead of being benefited by the operation, is likely to be most seriously

injured. The author of the above Essay thus states the progress of the evil. "When a branch is cut causing a large and unsightly wound, the sun cracks the wood; the water follows the cracks, lying in the chinks and rotting the wood; the frost follows the water, all tending to the destruction of the place, and hurt of the tree." When a large branch must be taken off, this writer advises that the wound should be well painted over; but this is a very partial and insufficient precaution. For though it may in some measure be a means of repelling damp, and preventing the sun from cracking and opening the pores of the wood, the wound will never be entirely and properly healed. It may become covered with bark, and if the tree is in a vigorous state may even in time be surrounded with several layers of young wood, but these will never unite properly with the old; the paint itself will be an additional means of preventing their union, and whatever time the tree may survive the operation, there will be found, on cutting it up, an *internal wound*, more or less extensive, causing a blemish in the timber, and in some cases materially lessening its value.

Mr Fowlie mentions a case that is worthy of attention—"In the year 1826, on having a very large oak felled in this neighbourhood (Hampshire), what appeared to be a great excrescence formed upon the tree was cut away, and displayed in the most perfect way the place where a large bough had been cut off, and a *complete case* grown over it. The knot had not decayed in the least, and it fitted into its place in a very extraordinary manner, shewing the impression of the cuts which had been made upon the knot very perfectly. The diameter of the bough was about 4 inches, and it could not have been cut less than 50 years."

In the case just mentioned, the evil does not seem to have been great; but in others the consequences of cutting a large bough are much more injurious.

Mr Gorrie observes—"The coniferæ are believed by some to give out an unction which facilitates the healing of wounds caused by pruning; but this assertion should be received with caution, for if in exposed situations large branches are lopped off to produce cleanness of stem, the wound will indeed heal over, but on cutting up it will be found that decay has penetrated a considerable way inward, injuring the value of the timber."

The author of No. 5 is, upon the whole, of opinion that,

instead of cutting large branches from old trees that have been too long neglected, "It is a far better plan to thin a few of the smaller branches out of the head, and take off some of the smallest from the bole, that are free of red wood, leaving the large ones to remain as they are : or otherwise, where they intrude on roads or any other object, to cut off the top of the branch where a perpendicular shoot comes out. This will keep the tree from damage, and assist in swelling the bole."

IX. *Evils attending snags or projecting stumps.*

Some persons, being aware of the evil consequences of cutting large branches close to the stem, fall into another and equally fatal error, by cutting them at a short distance from the stem, leaving a projecting stump or snag, which is at once unsightly, and hurtful to the tree. Mr Fowlie remarks on this subject, "That where a bough is to be subdued by shortening, the operation should be performed just beyond some pendent or horizontal shoot, which will then become the leader of the bough, and that every amputation, whether of a whole limb or of the subordinate shoots of a limb, should be so effected as to *leave no stump projecting.*

"If the part to be removed is cut off close to the main trunk," *when this is done with the proper precautions*, the great exertion which Nature immediately makes to heal the wound, will generally be successful, and the exposed surface will be speedily covered without any *apparent* injury to the tree. But if, on the other hand, a projecting stump or snag is left, it is soon deprived of vitality, and becomes like any other branch which has accidentally died. Now, every observer of timber, especially of oak, must have seen the ruinous consequences resulting from the neglect of the forester to remove such dead portions, which become conductors of wet into the body of the tree, and are assisted in doing so by the same exertion which would have healed over the wounds, had they been cut close off, now forming a cup round the base of the decaying branch."

X. *On the proper method of removing large branches, when it is necessary to do so.*

Notwithstanding the evils attending the removal of large branches, cases sometimes occur when it is necessary ; and in these cases it seems always advisable to begin with shortening the obnoxious branch. Mr Fowlie observes,—“Where trees have attained a more advanced age, without receiving due attention, the more prudent course will be to *shorten* the injurious branches (removing with especial care their vertical shoots), and so subduing them. In a very few years it will be found, that these robbers from the main stem have been so reduced in strength by the amputation to which they have

been subjected, that it will be either unnecessary to remove them at all, or easy to do so with a comparatively small wound, from the extent to which the increasing trunk may have swelled over the base of the bough thus arrested in its growth. The writer has, in very many instances, observed rival stems in forked trees reduced by this process to mere subordinate branches."

Mr Fowlie mentions a case where the process now recommended appears to have been attended with success. "About eight years ago, the writer's attention was called to an elm-tree of about forty years' growth, the pruning of which had been neglected, and there were many robbers in lateral boughs upon it. Hoping, by means of the natural system, to subdue these, it was determined to remove the smallest of them close to the tree, and to denude the others of their vertical branches, as far as the tree could bear their loss. There was, however, about eight feet from the ground, a limb which puzzled us from its great size. It was at length



decided that it should be curtailed of its top, at about five or six feet from the stem, as shewn at A, in the cut. The tree remained for four or five years without farther pruning; and it was most gratifying to observe with what success the experiment was crowned. The increase of the stem having now so much incorporated the swell of the limb with the trunk, that if it was to be wholly cut away, the wound would be less by three or four inches than if it had been removed at the first operation. The tree is now a very fine specimen, with a regularly tapering stem nearly fifty feet long."

The same system is recommended by Mr Cree, who gives the following directions as to the final removal of large branches.

"After the shortening has been performed, if for timber, a considerable period should be allowed to elapse before any of the branches be cut off close to the stem. The large branches should always be cut with a saw, and to prevent them from splitting by their own weight, they ought to be removed by two operations. The branch should be cut first 12 or 18 inches from the main stem, and finally close to it, but in such a manner as not to injure the adjoining bark. This additional trouble will be amply compensated by the superior way in which the wound will cicatrize."

Mr Cree adds a general direction, which has been already alluded to, applicable to the cutting of all branches, whether large or small, but of particular consequence when the size is considerable. "In cutting off the branches of all kinds of trees, the

branch must be cut *close to the swell* or protuberance which exists at the junction of the branch to the stem. When the branch is cut in this manner, the wound is not one-third of the size which it assumes when cut very close and dressed up to the circular form of the tree; and in proportion to the largeness of the wounds by pruning, will be the length of time required to cicatrize them. By adhering to the plan of first shortening, and afterwards of pruning close to the *swell*, which we have laid down, the wounds at the longest are healed in three years."

XI. *On the means of restoring trees that are top-heavy, and stunted from having too many branches.*

It is well known to every one that trees may be checked and stunted in their growth by being stripped of too many branches; so much has been said on that point, that it need not be farther insisted on. But it is less generally known that an effect nearly similar may proceed from the very opposite cause, and that a tree may be seriously injured in its growth, by possessing too many branches and too much foliage. Mr Gorrie has entered very fully into this part of the subject, which, as far as I am aware, has not hitherto engaged that degree of attention which its importance deserves. After remarking the evils arising from over-pruning, he goes on to say:—"On the other hand, although it has seldom been asserted by practical writers, yet I am decidedly of opinion that, under certain circumstances, where leaf-buds and leaves accumulate to excess, over-balancing the roots, and demanding more rising sap than these roots may form, or the soil be able to supply, there necessarily must be much less wood formed, than where a fair balance of root and leaf is restored by removing a proportion of those branches which cause an excess of foliage. This to the forester will appear obvious, for it is easy to observe that, where leaves are in excess as to number, the efficiency of these leaves (individually) must be diminished. In spring, indeed, the foliage comes out and unfolds fairly, but a healthy-like breadth of leaf is not and cannot be acquired. Soon after midsummer the leaves assume an autumnal hue. At Lammas there is no attempt at what is called the 'Lammas growth.' The young shoots never exceed half an inch in length; the roots become exhausted by over-absorption from above; the tree becomes bark-bound, and the growth is nearly at a stand-still." It is confidently believed that this is no exaggerated picture, and that Mr Gorrie has stated accurately both the phenomenon and its cause. It

appears to us that we have seen it verified in numberless instances. So much for the disease. Mr Gorrie thus proceeds to point out the remedy:—

“Supposing a tree to have been neglected from the tenth to the eighteenth or twentieth year of its age, and that the top has become bushy, the foliage numerous, small, stunted, and disposed to ripen prematurely, without any young wood being formed of perceptible annual layers or shoots, the latter, perhaps, not exceeding half an inch; let such tree be then gently, not too severely, pruned, and the consequence will be the produce of an ample broad leaf, retaining its verdure and efficiency throughout the summer and autumn months, and vigorous Lammas shoots will be produced. The leaves thus efficient, although fewer in number, yet upon the whole occupying greater breadth and more vigour, more sap will be elaborated, which will go to form enlarged annular layers, and renovated vigour will be communicated to the root.”

Mr Gorrie proceeds to mention some examples in which the efficacy of this treatment has been proved, one of which is too curious to be omitted. “On visiting a finely wooded property lately, the proprietor informed me that an old tulip-tree had long ceased to bear any young shoots, and shewed symptoms of declining old age. A few years back, a thunder-storm shattered several of its branches. From this accidental, though rude sort of pruning, the tree acquired fresh vigour, produced luxuriant shoots, and by-and-by the tree for the first time produced blossoms, and when I saw it, it appeared in a state of health and vigour, and bearing testimony to the fact that pruning contributes essentially to the health and growth of trees.”

This subject has not been so fully treated in any of the other essays; but they all seem to take for granted, if they do not directly state, that trees which have become top-heavy and stunted, by having too great a proportion of foliage, may be much improved by judicious pruning. Mr Cree states, that “Trees of considerable size which have been neglected or stunted, may be invigorated and restored to a healthy state by the application of the system we have laid down.” He also mentions the following case, where pruning produced a rapid growth on trees placed very disadvantageously:—“In 1825 a low beech hedge, twenty-four years old, was transplanted into a larch plantation, on land at fully 900 feet of altitude, and so great has been the effect of the pruning, that their appearance is now the same as if they had been plants of the best description, and some of them are now twenty feet in height.”

XII. *On the propriety of removing dead branches.*

All the writers are agreed as to the propriety of removing dead or decayed branches. Mr Cree observes,—“Wherever dead branches are found on any tree, they cannot be too soon removed, and even fir plantations, which, when thickly planted, are generally self pruned, will be improved by having all the dead wood pruned off.” In the essay No. 5, it is stated, that “Dead branches being allowed to remain on the bole only tend to produce moss, especially in damp situations; and their hurtful nature to trees of *all* kinds is too well known to require any farther comment.”

Mr Fowlie gives the following case, as shewing the injurious effect of allowing dead branches to remain:—“Connected with this part of the subject, the writer cannot help introducing a case suggested by an eminent timber-merchant in the neighbourhood, who called his attention to a very large piece of sided oak timber, entirely spoiled by an injury produced from this neglect. The sap or white wood of the dead bough had rotted, and communicated its decay to the whole wood of the main stem for some length downwards. Still, had the spine or hard wood of the dead bough been even then removed, the injury would have been comparatively small. But being left to unassisted nature, it had, from the firmness and durability of its texture, continued for years to act as a conductor of water through the already decayed part, until the whole of the timber was so infected as to unfit it, not only for Portsmouth dock-yard, (for which it had been intended), but almost for any other purpose.”

Mr Fowlie adds, “This description of pruning, viz. the removal of dead branches, is particularly necessary in old woods, when, after the trees have formed their spreading tops and stand thick, the under boughs are apt to decay altogether.” When this is the case, no time should be lost in removing them.

XIII. *What species of trees are particularly benefited by pruning, and what species are apt to be injured thereby.*

The following observations on this subject by Mr Gorrie, seem to be judicious, and to be drawn from an extensive experience. “Hard wood trees, for the most part, are improved by judicious pruning. A fair proportion of small lateral shoots, bearing healthy foliage, is, I think, absolutely necessary for promoting the growth of trees, whether that is effected by pruning or judicious thinning. Some sorts, however, demand more caution than others. Beech, for instance, is easily

hurt by excessive pruning, as it generally throws the leading shoot and its uppermost neighbours into a rambling state of confusion. This tree, however, is easily trained into an upright and lofty stem; but to effect this, a sprinkling of small laterals must be retained, forming an open cone of greater longitude than most other hard-wood trees. But as this tree suffers by the displacing of *large* branches more than many others, the laterals should not be allowed to exceed an inch in diameter till they are removed tier by tier from the lower part of the branched cone. The oak, too, though not so easily injured by large wounds as the beech, is also impatient of severe pruning; and to it the foregoing directions should be applied gently. The cedar of Lebanon, silver fir, spruce and Balm of Gilead firs, are impatient of pruning, and the timber liable to be deteriorated. The willow, poplar, and lime, too, are easily injured in their timber by injudicious pruning, and ought to be treated with much care."

XIV. On Pruning and Management of Coniferæ—Pruning of Firs and Larch.

There seems to be a considerable difference of opinion, whether trees of the fir tribe ought to be subjected to pruning. Some think they ought not to be pruned at all; others maintain that they may be benefited by pruning in certain situations. On considering what is said on both sides, we are disposed to lean to the latter opinion, and to hold that these, in common with all other species of forest trees, may be improved by gentle, cautious, and judicious pruning.

Mr Grigor says—"Firs—Silver, Balm of Gilead, Spruce, Scotch, Weymouth Pine, and Pinaster,—do not admit of being pruned in any soil or situation. Of these the Scotch fir stands it best, if performed in February. It, however, cannot be recommended. Indeed, there is seldom a necessity for pruning the fir tribe. If they are planted for ornament or for shelter, pruning would defeat the intention. When planted for timber they are generally so close that the smaller branches decay as the trees advance, and these should be closely removed from the trunk."—"Common Larch—*Larix Europæa*, *Pinus Larix*. This tree may be pruned with advantage at the time it sheds its leaves. As it naturally advances in a fine figure, pruning is unnecessary until it attains a height of from ten to fourteen feet. The strongest of the lateral branches should then be regularly lopped off, about two feet from the stem, with a pruning knife or bill. In two years after, these should be removed close by the stem, and those farthest advanced in size among the upper branches should be short-

tened as above described, it not being safe to allow those most vigorous to be at once cut off close by the trunk. In this manner, the tiers should be gone over every two years."—"The healthiest larches produce cones sparingly. Nothing marks the little progress of growth more than a great crop of seed; and when once the growth is impeded by such, the tree commonly continues to yield abundantly. In such cases pruning is particularly advantageous.

"In exposed places the tree should not be wholly cleared of branches to a certain height. The weakest should be allowed to remain, which serve to keep the tree more steady in rough weather."

Mr Gorrie observes—"The pine tribe, except in lawns, are generally planted in masses; and in such cases a due attention to regulate the distance at which they stand apart, will be preferable to the use of the knife or chisel. But in open situations, where length and soundness of stem is desired, pruning may be ventured on, taking care that a sufficient number of side-shoots are allowed to remain, and that none be allowed to exceed three-fourths of an inch in diameter, that are intended to be pruned off for the purpose of producing a clear stem. When trees of this tribe that have been thus attended to in their growth are sawn into deal, the wounds have not festered, and present a fresh and compressed *bird's-eye*

The author of Essay No. 5 has the following observations:

"Trees of the fir tribe will be greatly benefited by pruning, with a few exceptions. I have been told by some people, when in the act of pruning fir trees, that they would never make more progress in growth, and that they were ruined for ever. However, experience is by far the best teacher. Fir trees should be visited by early pruning, *at least the Scotch and the larch*. I begin to prune these trees when they are about five feet high, only taking away a few of the under branches from the bole. This pruning I execute with a strong hand-knife, laying hold of the tip of the branch with one hand, and at the same time applying the knife to the root of the branch with the other hand, cutting it upward. The bending of the branch makes it easy, and an active man, with a good knife, will go over a great many hundreds in a day. When the trees are farther advanced in growth, I use a hedge-bill with a short handle, and in every other description the same as is used for cutting over thorn hedges. After the first pruning is over, which should extend, if the trees are five feet high, about two feet upward in the bole, the pruning may again stand for two, or at most three years, when other two rows of branches may be taken off. In firs, as in all other kinds, it is better to prune gradually, taking off a few branches at a time, leaving only a few small wounds, than to allow the branches to grow large before they are cut, as large wounds are not so easily

healed. But at either the first or last pruning, when the plantation is a mixture of fir and hard-wood, and the firs in a short time intended to be thinned out, every branch that seems to obstruct or interfere with a hard-wood tree is to be taken away. Or otherwise, when the space is considerable between the firs and hardwood, and the branches that intrude cannot be wholly taken away, lop off the tops, giving the hard-wood room and air. The tops of larch branches, in particular, should be lopped off on all sides before they come to touch the hard-wood, as they are easily moved with the wind, and often whip the tops off the hard-wood. The pruning of fir trees at this age is of the greatest consequence, as it both admits the air and relieves the hard-wood, and serves in place of a thinning in cold exposed situations where the trees have not been very thickly planted, and where nursing is of the greatest service. On the sides of exposed plantations about four of the outside rows should be left unpruned for a few years, particularly on the south and west sides. As spruce firs are injured by pruning, and until the branches begin to die of themselves should never be touched, a few of them should always be planted in exposed situations. After Scotch and larch firs have received the second, or at most the third pruning (as no other kinds of firs should be pruned until the branches die of themselves), there should no more branches be taken off until nature seems to have no more use for them, that is, when they begin to die; they should then be pruned off, for if allowed to rot off, they will leave loose knots in the tree, which are liable to come out when the tree is cut up. But if the branches are taken off in time, viz. as soon as they begin to wither, the knots will remain firm and hard, and the plank can be applied to any suitable purpose. When the pruning is made on fir trees when young, the resinous matter that exudes from the tree resists all damp, and the growth of the tree is not in the least retarded, but on the contrary, greatly benefited by the admission of free air. I have measured the growths of fir trees, and found many of them from sixteen to twenty inches, even on poor soils, the same year that they are pruned. In the year 1813, I pruned some fine healthy Scotch firs about twenty years old, which never had been pruned before. The branches on the under part of the trees, about four feet up, were greatly decayed and rotten. These, with other branches not so much decayed on the upper part of the bole, were all clean cut off. These trees stood till the year 1828, when part of them were felled and cut up for various purposes. On examination, I found that, in the under part of the bole, where the branches had begun to rot, the knots were quite loose and came out quite easily; but in the upper part, where the branches were only now withered at the time they were pruned, the knots remained firm and hard. On the outside, the planks were quite clear and free from knots; and had the trees stood to old age, they would have produced sound timber, with the exception of the places where the branches were rotten before pruning."

XV. *Effect of pruning in regard to shelter, and in preventing damage by snow.*

Two of the writers bear testimony to the beneficial effects of pruning in these respects. Mr Cree observes: "When shelter alone is wanted, the shortening of the branches will be found, in a very material degree, to augment their denseness. By this means, too, trees can stand closer together without requiring to be thinned, and the whole of the branches are enabled to retain their vegetative power, and live for any length of time in luxuriant beauty. By a different management we often see trees thus reduced to the appearance of so many tufted poles, presenting no obstruction to the winds, which sweep through the plantation, and render the ground so hard that the trees in consequence become unhealthy. But by our method the green branches preserve moisture in the earth to make them healthy and to arrive at great magnitude.* Trees planted as sheep-stells, as well as in woods and belts of plantations, are, by the shortening of the branches, in a great measure prevented from suffering by the destructive effects of heavy falls of snow."

On this last subject we have a great deal of information in the Essay No. 5, but the passage is too long to be quoted entire. The author mentions that plantations in low and sheltered situations are most apt to suffer by falls of snow. Scotch fir suffers more than larch or spruce, probably because the branches of the latter slope downwards, allowing the snow to slide off more easily. Of hard-wood trees, the kinds that suffer most are those which are subject to form clefts, or where the stem is much divided into branches, as the oak and elm. Trees growing straight upwards and not subject to clefts, as the ash and plane, are not so liable to injury. But in these cases, he observes, where "the trees had been pruned, the damage is very little—or next to nothing. The under branches of the first being taken off, and also the clefts from the hard wood, and the branches of the trees being clear of each other, not locked and intermingled as in an unpruned plantation, there is less snow lodged on the branches, and though it does lodge

* We have no doubt of the benefit of the method here recommended, but we have some doubts with respect to the cause here assigned for keeping the ground moist. It rather appears to us, that if the branches are kept in a green and luxuriant state there will less moisture reach the earth, and the ground will be the drier.

and bend down the branch a little, there are but little weight and pressure, and whenever the snow subsides in the least, the branch gets clear and rises to its former position." He does not pretend to say that no damage will happen, for occasionally a branch or a tree may be broken; but there will not be any great or extensive injury, such as frequently occurs from heavy falls of snow in woods that have not been properly pruned or thinned. The author of this paper relates some instances of extensive damage from the above mentioned cause, but it is not necessary to go into these details.

XVI. Pruning of Coppice.

In Essay No 5, the following directions are given with regard to the pruning of coppice. "When the young shoots have arrived at six or seven feet high, go over them and prune off any coarse branches that have come out near the bottom of the shoots, also any clefts that may be forming at or near the tops; and when the branches close too rapidly in the middle of the stool, they must be pruned a little to give the shoots air and room, as the value of coppice-wood depends greatly on the straightness and cleanness of the trees. As they stand thick on the ground, they generally, if on an appropriate soil, draw up straight and clean of themselves; but proper attention is requisite to render every assistance to complete the desired object."

XVII. Pruning of alternate trees in Rows.

After describing his general method of pruning, by first shortening and then cutting close the lower lateral branches, Mr Gorrie states, as proof of the beneficial effect of this method, the case of a row of lime trees, one-half of which were destined to be taken out. Of these he says, "the reserves this season received their ordinary pruning after three years from a former pruning. Those intended to be removed were not touched, and both furnish examples of the results formerly mentioned," namely, that the pruned trees had made much greater progress than those which had remained unpruned.

Mr Cree mentions a case to the same purpose. "In 1829, I pruned every alternate tree in a row of limes which had been transplanted about thirty-two years; and were at the time completely rumped at the

tops. There were on each a number of leading shoots. One of these I left of a length conformable to the height of the tree, and shortened all the rest. The shortening was continued for three years. The pruned trees are now completely a-head of the others, and it is impossible to discover from their present appearance that they had been originally cut over. A number of elms were in like manner pruned at the same time, which advanced in equal proportion, some of them rising ten feet in three years."

XVIII. *On pruning timber for naval purposes.*

It is an important object in rearing timber for the use of the navy, to manage it in such a way as to produce the greatest proportion of bent pieces, or knees, which are very valuable in shipbuilding. Various methods are proposed for this purpose. Mr Grigor seems to rely much on the natural tendency of the oak to grow in bent and twisted forms, when it is not cramped by being grown in a very crowded plantation. He therefore advises that oaks should be planted near openings or on hill-sides, where they will not be much confined, the tree being most inclined to grow straight in crowded flats, especially when the subsoil is favourable. He gives, however, the following directions for pruning, with the view of producing bent timber. "When young oaks have advanced to the height of from eight to ten feet, their lateral branches should be pruned from the surface upwards close to the stem, to the height of from three to four feet; and if they are inclined to grow with a straight top, *the leading shoot should be cut off*, and two of the strongest of the lateral branches which take a horizontal direction should be left at those points where they will be least confined, and the next largest branches should be shortened at the same time. In the course of three years, or, if the plantation is very healthy, in two years, the trees should be gone over a second time. Those side branches formerly shortened should then be removed close by the stem, and the old top reduced to the point where the principal leaders take a horizontal direction. This method will generally occasion crooked trunks, which are always more valuable, of whatever figure, than straight trees. In many cases the shoots will incline to the perpendicular, and not grow in the desired form; but a far greater proportion of trees thus treated will be of a superior mould for naval purposes than are found among those where straight leaders have not been removed."

A somewhat similar method is recommended by Mr Cree :

"When oak is to be pruned for naval purposes," he observes, "instead of keeping it to one, it may be made to diverge into two, three, or four stems. By pruning it may be led to take almost any possible curve. The kind of management required will succeed best with trees which have arrived at some considerable size.

"Larch is the next tree in importance for naval purposes, and though naturally the straightest of trees, it can with a little art be made more readily than any other to bend and take any curve, and again to turn at right angles or any other angle."

Mr Fowlie remarks, that "proximity of roads, and rivers, or *any circumstances causing space*, form the best situations for the growth of bent naval timber.' This agrees with Mr Grigor's opinion, that trees are most apt to acquire bent shapes in open situations. To encourage the growth of such shapes, Mr Fowlie says, "The trees should be left thick on all outsides, that some may be overgrown and compelled to protrude themselves for light from under their more lofty neighbours. The exposure to which such trees are subjected, will occasion the formation of numerous tortuous boughs producing good crooks and knees, and fit them for the larger compass pieces. The pruner's attention will here be required to aid by timely training the formation of such valuable trees, and to remove any decaying branches."

The Essay No. 5, contains some valuable directions for producing bent timber, and points out for this purpose a different method from any of the above. "In training trees for naval purposes, crooks are much wanted. Whenever a tree of that description is found, it should be carefully assisted in its progress. Trees of that description may be trained from ten to thirty or forty feet high, should the tree permit, for various purposes in boat and ship-building. If a tree incline to crook after rising to a considerable height, a good part of the branches should be taken off the upper side of the bole, only leaving an adequate number to pump up the sap; while on the under side of the bole and head, the greater part should remain for a time in order to bend the tree, and draw most of the sap to that side of the bole, which will also swell the tree at that place. Also the leading shoot should be kept clear, taking off any perpendicular shoots that may spring out near the top. It is also requisite that every obstruction should be taken out of the way of the tree that may prevent it growing in a horizontal position. When the tree has run out a little in this manner, and the head attained to a good weight, the bole must be pruned, as directed in other trees. The head should then be made as light by pruning as possible, and the greater part of the branches left on the *upper* side of the trunk and head, to draw the

sap and swell the tree at that place. After the tree has stood in that position for a few years, the curve of the tree becomes gentle, and by allowing the branches *again* to grow on the *under* side of the tree, it will bend to the very position that is wanted."

Mr Gorrie says,—“ With regard to any peculiar mode of pruning, where bent timber for naval purposes is aimed at, much has been written, and little of written directions, so far as I know, has been reduced to practice. The oak and the larch are the two species most likely to be looked to as producing bent naval timber. The lateral branches of the oak should be encouraged to take a horizontal position, just where the top begins to form, and retained in that position by a mass of spray, encouraging two, three, or four shoots in opposite directions, giving them sufficient side-room, and promoting the growth of their laterals and preventing the sap from being diverted into a main stem far above where they proceed from the trunk. This will promote the growth of the horizontal branches, but this can only be performed in open situations. The tendency of all trees and branches to acquire a perpendicular position, renders artificial pressure to bend branches or stems a troublesome and often an abortive undertaking.

“ The best naval timber in the larch is to be found in the great roots which diverge horizontally from the stem, at or near the surface. Little can be done by way of encouraging these, except planting in shallow soils in sheltered situations, and marking such trees for reserves in thinning, whose roots indicate a disposition to form bent timber. It would be very difficult to keep the stem of larch bent by forcible means; but violent pruning young larch trees, about ten feet in height, leaving only about two feet of the top branches and leading shoot untouched, may serve to attain the object. If the trees are in a healthy state, this violent robbery will induce every one of them to bend almost down to the ground. As the tree recovers branches, it will again attempt to assume a perpendicular position, forming two bends that may be useful in ship-building. This pruning should take place in February; should it be deferred till the leaves are expanded, the plant would not bend so freely of its own ac-

XIX. Season for pruning. Different opinions respecting it. Theory proposed to reconcile these.

The greatest diversity of opinion seems to prevail respecting the proper season for pruning trees. Indeed *all* different seasons have been mentioned as the most proper by one writer or another. Mr Grigor says Scotch fir should be pruned “ *in*

February." As to the first, second, or third pruning of young trees, he says this " may be best performed in *any of the autumn months.*" He afterwards says, that "early in autumn is the best season for pruning the kinds now treated of (sycamore, maple, poplar, lime, gean, and mountain ash), as at this period the wounds immediately contract, and heal more readily than at any other season ; but the *shortening* of branches may be performed with safety until the beginning of March."

Of the oak Mr Grigor says,—“Nature hath constituted this tree more permanent, robust, and healthy than others, whereby it admits of being pruned or lopped at the barking season, when the sap runs most copiously ; but if the bark is of no consideration, like others the beginning of autumn is the proper season for pruning it.”

Mr Gorrie states that the birch, sycamore, and some of the coniferæ bleed freely if wounded early in spring, and perhaps the best season for pruning all such is *after* the young leaves have been from two to three weeks fairly expanded, and when the general circulation prevents the rising sap from flowing so freely ; for although the loss of sap may be of little consequence to the tree, yet it is a loss, and may be easily prevented ; and when allowed to flow, the wound, by becoming a channel for the egress of the sap, will not heal so rapidly nor so soundly.

“Every species of tree should be pruned *as near the spring months as its nature will permit*, as at that period the wound is no sooner inflicted than it begins to heal : whereas if the operation is performed in the early part of winter, the wound is exposed to the injurious action of the weather for several months, while vegetable vitality is in a dormant state. If pruning is performed late in summer, a season of healing over is nearly lost, and the wound is liable to be injured by the ensuing winter weather. It may be observed that the softer the wood is that is operated upon, the more care will be necessary to provide against lengthened exposure. Some trees, however, that yield gum, a sort of congealed sap, require to have their wounds formed and the discharging vessels dried before spring ; and pruning such in the end of autumn is found to prevent the issuing of gum, if the wounds are made in time to permit their cicatrizing before the frosts of winter set in. Of this class, the gean and the plum tribes are the most conspicuous.”

Mr Cree gives the following directions :—“It is of importance

to prune trees at the time which suits best the respective nature of each species. We begin to shorten the branches of all kinds of trees *after the beginning of October*. The maple and birch kinds ought to be shortened *before the succeeding January*. The shortening of all the other kinds to be discontinued a short time *before the buds swell*. The final amputation of the branches of the maple and birch kinds should take place when the leaves are expanded, to prevent them from bleeding: the oak and elm, likewise, when in the same state, to prevent suckers from springing out. The other kinds of deciduous trees may be pruned in the course of the *winter*, except the *gean* kinds, which must be pruned in *August*. Some have recommended August as the month in which this kind of pruning ought wholly to be performed. We have put this opinion to the test several times, but have always found that *the sooner the operation was performed after the trees were in leaf, the wounds healed proportionally better*. We do not approve of pruning in August, or any time in summer, unless it be in accordance with the nature of some particular species of trees. *The Scotch fir* to be pruned in *September and October*. The larch may be divested of its dead branches at any time. Others may be pruned at the same time as the Scotch fir."

There is one observation of this writer in which we fully concur, "There is surely much to learn respecting the management of woods."

Mr Fowlie states that, in his opinion, "the season best calculated for pruning all sorts of trees is *from the beginning of April to the middle of June*, for at this season the healing of the wound is accelerated by the rapid circulation of the fluids, and consequently the weather has less time to act upon the exposed part. The next best season is *a month earlier or a month later*."

The author of the Essay No. 5. informs us he has always found the most proper time for pruning is when the wounds will be least exposed to frost, rain, and sun. He observes, that—"the sun cracks the wound, the rain follows the crack, and produces consumption. The frost also has the same effect, penetrating into the wound, and, if pruned in a frosty season, the effects are the very same with the sun. But as it is impossible to get rid of all inconveniences, and when evils present themselves on every side, the least should always be chosen, I have always found by experience, that *the nearer the time of healing the wound is effected, so much the better*."—"The operation of pruning should be finished in all kinds of trees *before the buds begin to swell*, to produce the leaf, and, when done at that time, there is only a little moisture which flows to the top of the wound, and coagulates there, which re-

sists the frost, the rain, and the sun, and heals the wound; and in cases where the wound is too large to heal the first season, it hardens beneath that substance, and is not so easily hurt."—"It matters not whether the tree is late or early, or the soil or situation late or early, the proper rule is this;—*always finish the pruning before the swelling of the buds*, for if later, the sap flows more rapidly up, and forces itself out of the pores, injuring the tree. Any side boughs that arise from the effects of pruning on either the bole or branches, should be either pruned or scraped off in the end of July, or any time when they seem to advance, and continue to be so until they are wholly extirpated."

Some of the above directions seem to be exceedingly rational, and the reasons assigned for them sound and satisfactory; but some others do not seem to rest on any principle, and, at all events, they cannot be *all* depended on as correct, as many of them are inconsistent with one another. One (Fowlie) recommends as the best season the time from April to June, when the sap is running up with the greatest force; another (Gorrie) says no trees should be pruned at that season, as the sap will run from the wounds, and prevent them from healing. One advises us to prune before the buds swell (No. 5.); another after the trees are in leaf (Cree). One says, the proper time for pruning the Scots fir is in February (Grigor); another in September and October (Cree). The different periods here pointed out cannot all be the best. Upon the whole, we cannot help thinking, that some of the directions given, and the reasons assigned for them, are a little fanciful; and as we have the testimony of the authors, that all of them have been put to the test of experience, and have been attended with success, we may be tempted to conclude, that, provided we use proper caution in pruning, and do not cut very large branches, it is not of very material consequence what season we choose for the operation; and that the smaller wounds caused by the prudent and gradual pruning formerly recommended, will heal in a reasonable time, and without any great damage, at any season of the year.

But although this may be true in general, there can be no

doubt that there are some seasons more proper than others for pruning, when large boughs are to be cut. And notwithstanding the opinion of Mr Fowlie,* we cannot think the best season for such an operation to be "from the beginning of April to the middle of June," when the sap is ascending through the pores of the tree, with a force equal to what would be communicated by the most powerful of Bramah's hydraulic engines. Neither would we think it a proper season to prune in the beginning or depth of winter, when, as Mr Gorrie expresses it, "the wound would be exposed to the injuries of the weather for some months, while vegetable vitality is in a dormant state." What appears to us to be most reasonable (and we think it also agrees with the opinions of most of the writers) is, that a good time for pruning is a little before the buds begin to swell,—or a little while after the leaves are fully expanded. In either of these seasons the tree is not quite devoid of vitality, and, at the same time, the sap is not running with its greatest force. There is just enough of vegetative power to commence the healing process, and not so much as to force out the sap very copiously, so as to keep open the wound, and convert it into a running sore. Again, after the second period above spoken of, viz. about the end of July or beginning of August, nature makes another effort. The vegetative powers again put forth their strength, and the sap runs up into the boughs, to form what is called the Lammas shoot. This, therefore, we would not consider a favourable season for pruning. It is better to wait till this second effort relaxes, and the vegetative energy is again quietly exerted in ripening the preceding shoot, before we recommence our pruning operations. This brings us to the months of September and October, which are generally admitted to be a good season for pruning. At this season, as at the other two formerly mentioned, the tree is not without sap; but this sap remains in a quiet state, fit for the formation of wood, and

* See p. 170.

well adapted to commence the process of healing. According to this view of the matter, there will be just three periods of the year when pruning should be abstained from, and three when it may be conducted with advantage. The season of winter, the season from the first swelling of the bud to the full expansion of the leaf, and the period of the autumnal shoot, these are to be avoided ; and the operations are to be confined to the intervals between these periods. This view of the matter appears at all events to rest upon an intelligible basis, and to be consistent with the well known and universally admitted principles of vegetable physiology. It appears, moreover, to be calculated in a considerable degree to reconcile some of the discordant opinions stated in these papers. If it shall be found correct, it may be quite safe and proper for instance to prune firs, either in September, or in February ; and in regard to deciduous trees in general, these may be pruned either *before* the swelling of the bud, or *after* the leaves are expanded, either in the end of spring, or the middle or latter end of autumn ; and in this way the directions given by different writers, though apparently at variance, may all be quite proper. We have, in our own little experience, seen pruning performed at all these seasons, without any evil consequence. We are therefore encouraged to offer this view, as affording at least a probable solution of the apparent difficulty, as an attempt to reduce what has hitherto been a chaos of conflicting opinion into something like system ; and we do so in the hope that our theory may be fairly brought to the test of experience by those who have the opportunity, and who are qualified to do so with effect.

XX. *On the question how far the value of Timber is affected by Pruning.*

I. *As to Quantity of useful Timber.*—Mr Cree observes, that there is a great difference in the rapidity of the growth

of trees which are pruned and those which are not.—“ If we form an estimate of the comparative value of pruned and unpruned trees, raised within an equal number of years, the advantage which the former possess over the latter is very great. Take 25 elms indiscriminately, of a size suitable for making naves for wheels, it will be found, if unpruned, that the quantity of timber will not average in each above 5 feet. Twenty-five trees which I have pruned will *each contain more than 30 feet of timber*, when arrived at the age of the trees I have described above. Pruning is equally beneficial to all sorts of deciduous trees.” “ Pruning is of great benefit in removing fog (lichens and musci) and other useless excrescences. I pruned some trees which were completely fogged, in 1823-4 & 5, and such was the effect, from the rapid growth of the tree, that in the course of three years the moss (lichen) had lost its hold, and was hanging in tatters on the trees. A number of these trees advanced 10 feet in three years, and one of them advanced 5 feet in height in the year 1825. Even trees which were greatly stunted, often advanced 10 feet in the three years after being pruned; of which truth we could produce numberless examples.”

The author of the Essay No. 5. refers to what may be often observed in trees that have received no pruning at an early period, that “ many of them are clefted before they attain a considerable height, and these clefts rising upwards, produce other clefts, and spread out branches in all directions, leading away the sap which should have supported the bole into a great number of small branches; these, in a few years, produce a large head in the tree, leaving a very short bole underneath, perhaps only ten feet high, whereas by proper attention and *timely pruning*, it might have been lengthened to four or five times that height, besides producing a tree free from cross wood, which is not the case with clefted trees.” He also observes, that in the forest and in close plantations, “ if trees have been visited with early pruning, they will in general be rising with clean straight boles, and tapering in the heads, sending forth strong yearly shoots, in consequence of the sap being confined to the proper place.”

2. *Price per cubic foot of pruned, compared with that of unpruned Timber.*—Mr Grigor, in reference to this point, gives us the following information: “ In the district where we reside, the usual method of disposing of timber is by public roup, and the cleanness of the trunks regulates the price per cubic foot. Those grown

clean without requiring pruning, and those that have been carefully pruned when young, sell at least one-fifth higher than such as are mutilated by pruning in old age, or knotty, for want of pruning in youth.

The common prices are, for clean well grown ash

and elm,	.	.	.	2s. 6d. to 2s. 8d. per cubic foot.
Mutilated or knotty do.	.	.	.	1s. 9d. to 2s. per do.
Beech at	.	.	.	1s.
Good do.	.	.	.	1s. 6d.
Principal pieces, do. for ship-keels,	.	.	.	2s. 6d.
Oak of a good size and figure for	.	.	.	.
ship-building,	.	.	.	3s. to 3s. 6d.
Do. straight,	.	.	.	2s."

Mr Gorrie states, "In regard to the value of timber which has been pruned, and has stood detached in hedge-rows, every thing will depend on the mode in which that operation has been practised. In attending or conducting sales of wood, I have invariably found that trees from which large branches have been lopped, brought less money, in proportion to the supposed evil inflicted; and I have observed it necessary to defer fixing the price where such mutilation was dreaded, although no indication appeared, till after the wood was cut up. But where trees stood single, with a sound and healthy exterior, and where no flaw from improper pruning was dreaded, the price affixed for each tree was fully as much per solid foot, as for trees grown in masses of the same size in the forest. It is not judicious *pruning*, but *mutilating*, that affects the value of timber."

In Essay No. 5. it is stated that all timber-dealers, ship-builders, carpenters, &c. allow that the value of trees depends on what kind of a forest, and what part of a forest, they have stood in. If they have stood in a glen, and risen clean and of good quality, they will bring the highest price given for wood of the kind. If they have stood in the outskirts of a forest, and are coarse and knotty, they are not worth above 50 per cent., or half the price of clean well-grown wood. If they have stood in a well-sheltered forest, and the quality of the wood in general good, with few large knots, they may be worth 90 per cent.; or if they be coarse with large knots, they may be worth 70 per cent. If detached trees have been injudiciously pruned, and large branches taken off, they are depreciated more than one-half. If they have been *judiciously*

pruned, and as detached trees are generally hard and good, they are worth as much per foot as the good and clean specimens grown in a forest, without pruning. Hedge-row trees in general are of a hard nature, and if raised clean, they are, as far as measurable, equal in value to the best ; but, if coarse, they are hardly worth the half.*

XXI. *Pruning Trees for Picturesque Effect in Lawns.*

As this is a matter which depends entirely on taste, and in which we have not the standard of utility to guide us, nothing more can be done than to state the opinions of the different writers seriatim, leaving the reader to pay to each the attention which it appears to deserve.

Mr Grigor observes, that “ some consider trees which expose

* *Caution with regard to hedge-row timber.*—We may here mention a circumstance which has repeatedly fallen under our notice, which often materially affects the marketable value of hedge-row timber. It frequently happens, in closing gaps, and otherwise repairing the fences of fields where there are hedge-row trees, that the carpenters, to save themselves trouble, wherever a gap occurs near a tree, instead of putting down a stake, nail the paling to the tree itself. This is a most mischievous practice, and many a tree is thus seriously injured. It almost invariably happens, that in a few years the paling is removed, or becomes decayed, and the nails remain sticking in the tree, and, in the course of its growth, become covered by the new layers of wood, so that nothing appears externally, or till the tree is cut, when the carpenters only receive notice of the evil, by their tools coming in contact with the iron thus imbedded in the tree. Where this practice has been known to prevail, I have seen that hedge-row trees, to all appearance quite clean and sound, would not sell for *one-half* of what they would have fetched if grown in any other situation, the carpenters being deterred from buying them, by the fear of destroying their tools. It is desirable that all proprietors, and those who have charge of estates where there are hedge-rows, be especially on their guard against this evil, as I have seen much valuable timber, from this cause alone, depreciated 50 per cent.

their trunks to a great height, not only most valuable, but also most ornamental. Our taste is different; we consider pruning of lwn trees injurious, whether standing singly or in masses, beyond the removal of a shoot when the young plant is too bushy, or when it may be necessary to amputate a decayed branch in its more advanced state. Perhaps in nature there is not an object more lovely and magnificent than a lofty tree, happily situated in a congenial soil, standing unmutilated, with foliage suspended to the surface of the earth, and unveiling only here and there a part of its glo-s-y trunk of goodly dimensions."

Mr Gorrie states, "I conceive that every species and variety of tree has by far the most elegant and picturesque appearance when allowed to assume the natural form, undisturbed by the knife or chisel."

Mr Cree is of opinion, that "where trees are intended for ornament, *every diversity* of form should be adopted which may appear best suited to the nature of the ground. Some should have broad, others conical heads. Trees standing singly, and those along approaches, ought to have branches hanging down to the ground. They may be pruned so far up, but no higher, than the point from which the pendulous branches can reach the earth. When trees are young, however, they ought all to be shortened in the branches, as every tree in time acquires its characteristic form."

Mr Fowlie states it as his opinion, "That there is nothing in *pruning* which detracts from the picturesque effect of forest trees; and in woods or coppices, managed for the production of timber and underwood, the value of the coppice, and the growth of the timber, for all the various purposes of the carpenter and shipbuilder, *as well as the production of picturesque forms*, are all excellently dependent on each other. For groups of trees, having their compass pieces on their outsides, with their straight plank logs within, give all that is required as to timber; the intervals encourage the growth of the underwood and succession, while the masses of trees of unequal height, give to the beauty of the landscape all that the most fastidious taste can desire."

The preceding observations are all extremely good in their way, and may each, and all of them, be acted on with propriety in suitable circumstances and situations; but it must be left to every one's own taste and judgment to apply them, and it would obviously be out of place here to enlarge farther on the subject.

XXII. *Of Grafting for Picturesque Effect.*

On this subject Mr Grigor observes, "that several varieties of trees which must be propagated by engrafting or budding, are, in his opinion, inferior to the ordinary kinds of their species, such as some varieties of variegated holly, variegated sycamore, &c.; but there are others which, in his opinion, should be more extensively cultivated, viz.:

Scarlet, double-flowering, and other varieties of Thorn.

Scarlet-flowering Horse-chestnut.

Purple Beech.

Snake-barked Maple. And,

Weeping Elm.

The last mentioned of these is not common, although it grows rapidly, and when grafted at the height of eight or ten feet, it is particularly well adapted for standing singly in a sheltered lawn or pleasure-ground, it being, in the writer's opinion, more spreading and picturesque than any other tree.

"The common trees of the species form the stocks best adapted for being engrafted with the rarer sorts, as the nearer the kinds are related, the union is rendered the more perfect and permanent."

Mr Gorrie treats the subject of engrafting at greater length than any of the other essayists; and as he seems to have paid considerable attention to the subject, we shall give his observations entire: "Much (he says) may be done in a little time towards ornamenting park or lawn scenery by engrafting scions from ornamental trees, on established and growing plants of the same genus. As, for instance, the scarlet maple will soon form a beautiful object, if grafted on a vigorous young tree of the Norwegian or other common species of *acer*; observing that the scarlet maple prefers a humid soil. The purple beech, wrought on a plant of ten or fifteen years' standing, will appear conspicuous in a much shorter period than if wrought on a two or three years' old stock. The grafting of the weeping ash on a lofty plant of the common ash is indispensable for shewing the drooping nature of that singular variety.

"The Kincairney Ash, a most fantastic variety, will soon exhibit a most fantastic appearance, by being grafted on an old plant of common ash, of about twenty years' standing. The white thorn would furnish a ready stock even in hedges, near pleasure-grounds, for developing the beauties of the numerous and elegant varieties and species of *Cratægus*. A varie-

gated elm or ash might soon take the place of common plants of these species: and oak of broad and narrow foliage might soon be made to stand on two common oaks in juxtaposition. Many of the new and interesting class of Coniferae might be wrought on the common firs, spruces, and larches of the country. To the uninitiated perhaps a short description of the *modus operandi* may not be altogether unacceptable.

“The simplest and most successful method of grafting on old trees, is to saw off the top, make a slit about an inch and a-half long, in the bark of the stock, raise the bark with an ivory handle; prepare the shoot to be grafted by a smooth slanting cut in one side; take a small piece off the point, to prevent the bark folding in pushing it in; slip in the proposed scion, with the cut side next the wood, to the length of the cut; tie round with mat, and cover closely, with a ball of grafting clay, all over the wound on the stock. Graft when the buds are swelled.

“Any of the pine tribe may be wrought on the Scots fir. The season is when the young shoots are firm and easily broken, and before they reach full length. Divest the shoot of the stock of a few of its upper leaves. Cut it over near the point; slit it downwards an inch and a-half; prepare the shoot to be inserted, by divesting it of part of its under leaves; form like a wedge; insert so as the barks of the graft and the stock may touch each other; tie gently with mat, and cover the wound with a light ball of grafting clay. Spruce will take on spruce, and the different varieties of larch on the common. Although grafting on old trees will never supersede the use of young plants, yet the process may be resorted to for producing immediate effect near drives and in pleasure-grounds.”

ON THE CULTIVATION OF CHICORY AND FLAX IN BELGIUM.

By ALEXANDER THOMSON, Esq. of Banchory.

(Mr Thomson received the Silver Medal for this communication.)

CHICORY (*Cichorium Intybus*) has been long cultivated to a very considerable extent in Belgium, the north of Holland, Germany, and the north of France; but it is only lately (I believe within the last two years) that it has been exported to England in large quantities.

It is sometimes used as a substitute for coffee, but more

frequently a portion of it is mixed with the real coffee, which is thought to improve the flavour, and also to render the beverage more wholesome.

Mistaking it at first for the common garden Endive, I was surprised by the quantity of it which I saw grown in Belgium. On inquiry, I learned what it really was, and that it was expected by the Belgians to become an important branch of their export trade.

As the plant is very hardy, and grows well in various soils, it appears to be at least worthy of a fair trial in this country.

It is sown from the 25th April to the middle of May. On warm land it is considered best to sow it in the beginning of May, for the plant is apt to shoot up too quickly if sown sooner, and to run to seed. Chiccorry is cultivated both on rich and on light lands. If the ground be *rich*, it ought to be ploughed or dug over with the spade before winter, and harrowed once or twice (or oftener if necessary) in spring, that it may be as fine and well-broken as possible. If the ground be *light*, it is prepared in the same way, except that the ploughing does not take place till after winter. A rich clay or strong loam produces the best crops, and a very sandy soil is not suited to its growth. It is sown broad-cast, and after the plants are well up, they are thinned out, so as to stand finally about six inches apart. The crop must be kept clean by hoeing and hand-weeding. In short, the cultivation of chiccorry is similar to that of turnips or carrots with us, except that I am not aware of its ever being sown in drills, though I do not see any reason against it, and should expect it to be the best mode of management.

The quantity of seed sown is 4 killogrammes, or 8 lb. per bonnier, which is equal to 2 acres 1 rood 35 perches imperial measure; and therefore about 3½ lb. are required to the imperial acre, sown broad-cast. After sowing, the land is harrowed and rolled.

In one point, the information I have received appears contradictory. It is stated, on the one hand, that the crop is rather trying to the ground, and, on the other, that unless the land is very poor only three-fourths of the usual quantity of manure is required. It appears to me, that from the nature and growth of the plant, it ought not to be an exhausting crop, if it receive its fair allowance of dung.

In the north of France, poppy oil-cakes are used as manure for it, with as much success as common manure.* They manure the land *always* in the preceding autumn, and not in the spring, immediately before sowing.

The crop seldom fails unless there be very dry weather after the seed is put into the ground, moisture being essential to its growth.

When it has come to maturity, the roots are taken up by a spade about one foot long and six inches broad. After the roots are dug up, which is done in September, October and November, they are conveyed to a ditch or pool, in order to be washed and freed from earth, &c.; but in the Walloon country, where water is rather scarce, that process is omitted, which renders the produce less valuable. Whether washed or not, the roots are cut in pieces, and kiln-dried or roasted, after which they are ready for being ground. The loss sustained in the weight, after being roasted, is about 20 per cent., and, in general, about 3 per cent. of butter is added in the roasting, which makes it much richer when ground.

The crop generally pays well. The produce is seldom below three tons per acre, calculated after kiln-drying. The price for several years was steady, at from 12 to 15 francs per 100 killogrammes, say L.4, 15s. to L.6 per ton; but within the last twelve months, the demand for England has been so great

* Poppy oil-cake is said to be as efficacious a manure as rape-cake, and it is sold in Belgium at a much lower rate. I am not aware that it has yet been introduced into Scotland.

that the price has gradually risen to 35 and 36 francs per 100 killogrammes, or L.14 to L.14, 10s. per ton, thusmaking to the farmer the enormous return of L.42 to L.43, 10s. per acre ! It is supposed that within the last two years about 10,000 tons have been sent to England from Belgium ; but there are no means of giving a very accurate statement of the quantity : the demand continues to increase.* It appears very evident, that with the present low prices of ordinary kinds of agricultural produce, it is a matter of national importance to draw attention to every plant which is of use in any way, and which can be cultivated in Britain, and for this reason I have called the attention of the Society to chiccory.

With regard to the cultivation of Flax, I consider it as a matter of very great importance. It was in former times grown to a considerable extent in this country, though now the quantity of it is comparatively very small.

In Flanders it is most completely a domestic branch of industry, almost every farmer grows more or less of it, and it is the winter employment of his wife and children to prepare it for the market. It is almost all grown in small quantities, often in patches of one-eighth of an acre, or even less. The Antwerp flax merchants employ men for the purpose of travelling over the country, and, besides public markets, each has certain fixed days, where the flax is delivered at certain places by the neighbouring peasants, and paid on the spot. The quantity sold by each peasant is regulated by what his family may have dressed during the previous week or fortnight, and is often no more than half a stone, and seldom exceeds two or three stones. Their flax stone is 6 lb. imperial.

The peasantry are in general proprietors of their farms, which are often of small extent. The flax is grown once in six years on the same ground ; some have tried it once in

* Mr Macculloch even in the last edition of his *Commercial Dictionary* in 1837, takes no notice of the quantity of chiccory imported into this country : and the plant is there termed succory. *Ed.*

three years, but it is not found to answer when so often repeated.

The ground for it must be thoroughly manured with *cow dung*; no other is used.

It is sown at two different periods, March and May, to give it a double chance; but the last sowing is often nearly as soon ready as the first, and frequently both succeed equally well.

The ground requires to be well worked previous to sowing, so as to be broken into very fine tilth, and Russian seed is preferred.

A good fair crop will produce about 400 stones of dressed flax, of 6 lb. each per bonnier, 2 acres 1 rood 35 poles, or about 160 stones per acre; 360 stones make a ton, and the price of the best flax, according to its fineness, varies at present from L.60 to L.90 per ton; so that an imperial acre produces about L.27 to L.36 to the farmer and his family. Of this price, however, a considerable portion is the wages of the family for dressing or swingling, which costs about 8d. per stone, or L.12 per ton, and supposing the crop 160 stones per acre, then the family have L.5:6:8 for swingling, and the farmer has the remainder for the return from the ground. A good work-woman will swingle a stone a-day. It is in that point of view that it appears to me so important to attempt the re-introduction, on an extensive scale, of the growth of flax into Scotland, not to be dressed at the mill, but to afford employment to our female peasantry, who can now earn little or nothing during winter. Machinery has put an end both to knitting and spinning, and this dressing of flax seems well calculated to furnish them with an employment which would profitably occupy their leisure hours. It would be easily learned, and is neither laborious nor unhealthy.

The implements used are extremely simple. I purchased a set for a few francs, and have sent them to Mr Lawson, our enterprising seedsman, to be deposited in his museum, where

any one may see them, and from which, as models, others may most easily be made.

Fig. 1.

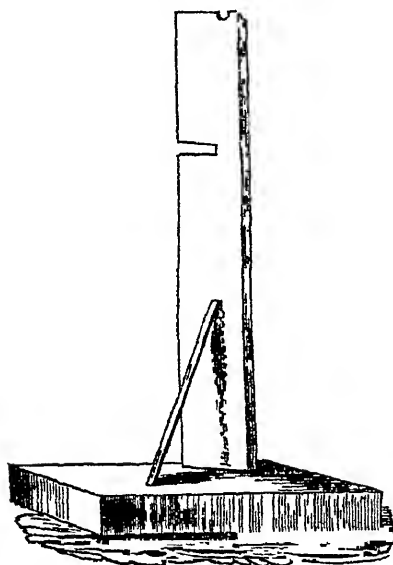
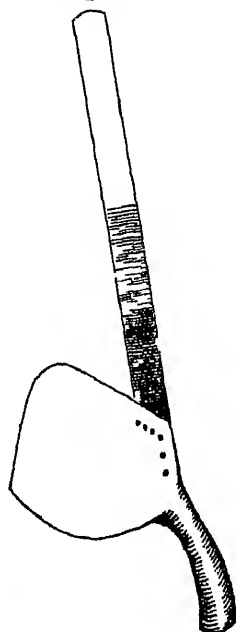


Fig. 2.



A tolerably heavy plank of wood Fig. 1, supports an upright board, which is sunk into it, and steadied by a back stay. The board is about $4\frac{1}{2}$ feet high by 1 foot broad; about $3\frac{1}{2}$ feet from the bottom is a slit about 7 inches long, and $2\frac{1}{2}$ wide, through which the flax passes while being dressed, and at the lower edge of the slit the board is somewhat cut away to prevent the scutching-knife striking the fibres too hard. The flax is held in the left hand, at the back of the board, and hangs through the open slit; and it is dressed by the skutching-knife, Fig. 2, held in the right hand, which is invariably brought close upon the upper part of the board, and thus directed down upon the fibres. A very little practice will enable any one to do it.

The scutching-knife is of wood of this form, Fig. 2; the blade being about 18 inches long, and the flax is struck sometimes by one edge of it, and sometimes by the other.

The only other implements required are a leathern apron, a comb for unravelling the fibres when necessary, and a tool, like a blunt mincing-knife, which is used when requisite for breaking the outer coat of the flax on the knee, before beginning to use the knife. All these are sent to Mr Lawson.

The dressers are continually feeling the flax with the hand, thus judging of the progress they are making, and regulating their strokes accordingly, so as to leave no stalks imperfectly dressed, and yet not to break almost any of the fibres. In answer to repeated inquiries, I was assured that flax dressed by a mill was never fit for the most valuable purposes, and of course never could command the highest prices. Scutching-mills dress flax well enough for the more ordinary purposes, but machinery has not yet, and probably never can be contrived capable of preparing it in its highest perfection. This struck me as being necessarily the case, as soon as I saw the manual process going on, and farther inquiry confirmed the opinion.

I mentioned before, that, last season, the finest flax in Flanders was sold as high as about L.90 a ton, and the future progress of this flax is singular. A great part of it is exported to Britain, where it is spun by machinery into threads of extraordinary fineness. A considerable portion of it is returned from Britain to Flanders, or sent to France, where it is used for making the finest lace, and the ton of flax, which costs our manufacturer L.90, is perhaps, within a few miles of the place of its growth, sold by him in its manufactured state, at a price, as I was informed, generally exceeding L.2000 a ton! As no mills can dress flax so fine as the hand, so no hands have yet been found which can spin threads so equal and so fine as our improved machinery, and yet great as is the additional value of the spun thread above the flax, a yet greater

addition is made, when these threads are wrought into lace ; thus beautifully in the economy of Providence is one substance, in that, as in thousands of instances besides, made to furnish employment and comfort to various classes of human beings, far removed from each other, during the various steps of its progress, from the raw material to the finished manufacture.

I am not aware that there is any thing in the Belgian management of the flax crop as to steeping, watering, &c. materially differing from the mode of proceeding when it is grown in this country. The crop is pulled, and bound up in small sheaves for two or three days. The seed is then stripped off upon a machine for the purpose. A solid block of wood 18 inches long by 10 wide, and 6 or 7 high, supports ten or twelve strong square iron spikes, about 15 inches long, inserted into it, pointed at the top, and about an inch asunder at the points, and growing thicker, so as nearly to meet at the bottom, somewhat like what basket-makers use for peeling willows.

A sheaf is stuck upon the points, and drawn sharply through, and repeating this two or three times, completely clears off all the seed.

It is then steeped from eight to twelve days, and when ready, is taken out and spread to dry, either on grass or stubble, or on the bare ground—it makes no difference ; and in this stage it is considered of great importance that it be well soaked by one or two days of rain, artificial watering not being found to produce the same effect. As soon as it is dry, after having received this natural watering (for which it has often to lie for weeks) during which it has a most miserable appearance, it is again bound up in small sheaves, and stowed away in lofts and barns, to be *swingled* during autumn and winter. The first flax of the year is generally brought to sale by the middle of September, or beginning of October, and the season of sales lasts about five months.

I made particular inquiry whether the extensive cultivation

of flax in Ireland was not affecting the demand from Belgium, and was uniformly answered that it did not, that the demand was always greater than the supply, and, besides, that the Irish did not at all come into competition with the finest qualities.

On maturely considering the value of this crop in every point of view, both while in Belgium and since my return, I am deeply convinced of the important results that would arise from its cultivation in Scotland, particularly to our smaller tenantry.

In conclusion, I may observe there is an implement used in thrashing in Belgium, which, so far as I know, has not been tried in this country. The purpose of it is to take off the heads of the grain before thrashing, and thus save the straw from being bruised or broken.

The implement is sent with the others to Mr Lawson. It is a block of hard wood, about 9 inches by 7, having its lower edge cut into seven ridges or teeth, and worked by a bent handle inserted into the back of it. I have only seen it used with wheat, but was told it was also used for other grain. The sheaves, which are not larger than a man can grasp in his hand, are laid out in the summer's sun, along the wall of the barn, or on any hot spot, when the heat soon makes the straw quite brittle. In winter, I was told, similar exposure to a sharp frost produced the very same effect. They are then carried to the barn-floor, unbound, and laid regularly along it, as much at a time as covers it from side to side, (several rows at once, if there be several men employed at the work). A man, then, with one of these tools, standing opposite to the heads of grain, begins at one side, and strikes just above the ears, drawing the tool towards him, and thus very speedily clears off the whole ears, without touching the straw. The straw is then bound up again, and the ears swept into a corner, until a considerable quantity be ready, when they are thrash-

ed out with the common flail. When the straw is wanted for thatching, there can be no question of this being an excellent mode of proceeding; but I am a little doubtful if our straw be sufficiently brittle in ordinary years.

ON THE INFLAMMATORY COMPLAINTS OF FARM-HORSES.

*By Mr MATTHEW M. MILBURN, Thorpfield, near
Thursk, Yorkshire.*

[The Premium of Five Sovereigns was awarded for this Essay.]

Causes.—In order to clear our investigation of some difficulties, it will be necessary to shew that there is not any peculiar predisposition to disease in the breeds of horses usually employed in heavy draught, nor to any particular and characteristic conformation of the animals, which, I think, can easily be done. The coach-horse and the draught-horse are now very frequently bred from the same mare, and the breeds are so completely crossed and intermixed, that further than form and capability, with a sufficient degree of blood in the case of the coach-horse, they have lost their distinctive breeds. The horses employed in the cultivation of light soils, which the introduction of turnip-culture has so much extended, has caused the coach-horse and draught-horse to assimilate very closely. The peculiar characteristics of the old Suffolk breed, is lost in the continual crosses which have taken place to obtain more speed, and the farm-horses generally, perhaps with the exception of those used on very heavy soils, are partaking much of the character of the coach-horses of some ten years ago, and although a lighter class of animals have of late years been held in requisition for light work, to suit the rapid communication which our commerce demands, still so much intermixture has taken place in the different breeds, that no distinction can be pointed out between the one and the other, in so far as liability to the diseases in question is concerned. We are not aware that any peculiar conformation has any connection with the predispo-

sition to such diseases. The horse required for fast-work must have a capacious chest, to admit of the rapid propulsion of the blood which his exertion demands; but the horse of heavy draught also is valuable for his depth and rotundity of chest, to enable him to perform the tremendous exertion which is occasionally required of him. There are two instances, however, where constitutional peculiarities may predispose to the complaints in question. There are certain horses denominated "*washy*," or horses in which the space between the last false rib and the hip-bone is wide; in the language of the jockey, when he is not "well ribbed home;" such are known to be liable to diseases of the bowels when put to extra exertion,—but upon what principle I am unable to say. Others have a natural or acquired habit of voracious feeding, which is extremely prejudicial to the healthy action of the digestive and excretory organs, and to which I shall presently allude.

The post-horse, and such as are required to perform fast work, are more liable to attacks of diseases of the brain, the nerves, and the lungs, simply because their work consists of rapid and powerful exertion;—the farm-horse,—the animal of long and steady exertion, to gripes, inflammation of the bowels, and stomach staggers,—results, as I shall presently shew, of a management unsuited to the character of the labour we require from them. The stomach of the horse is remarkably small;—smaller in proportion to his size, and the quantity of food he requires, than any other domestic animal. Nature intends for him a supply of nutritious food, and that *at short intervals*; wherein he materially differs from the ox, whose capacious stomach will contain food which will not be digested for hours. The post-horse, the hunter, and the carriage-horse, have food of the most nutritious description, and the time during which they are worked is necessarily short, owing to the extreme exertion required; they return to their food, and although their appetite may for a time be impaired, and

their stomach and bowels affected by the general debility of the system, yet they recover their tone, as soon as the rest of the frame admits of their taking food. The farmer's horse, on the contrary, has food of a less nourishing nature;—his rack is filled with straw, or at best with clover;—the ploughman rises early, gives him a feed of corn, and leads him to his work, where he continues for seven, eight, and even nine hours, and his whole day's work is completed before he is allowed to eat. We do not find the ox, worked under similar circumstances, so affected in the stomach and bowels, simply because his capacious stomach, when filled, requires many hours to empty, while, as we have seen, it is different with the horse. Debilitated and hungry, the horse returns, and his rack is plentifully supplied, and a good feed of corn given him, and he is left to himself; he eats voraciously, half masticates his food, loads his debilitated stomach, and his digestive organs are weakened, and permanently injured. This course is repeated,—a habit of voracity is acquired, and at no very remote period the food lodges and obstructs the pyloric orifice (the passage from the stomach to the bowels), fermentation ensues,—gas is evolved, the stomach distended; he grows sluggish and sleepy,—drops his head upon his manger; or he is delirious, and evinces that the sympathy which exists between the stomach and the brain has excited the latter organ; he rolls, paws, and is seized with convulsions; at length he expires, and he has died of stomach staggers. If the previous history of the horse is examined, it is probable that he has been subject to gripes; thus shewing, not only the connection between the common management of farm-work horses, and diseases of the organs of digestion and excretion, but between the two latter. The half masticated food has irritated the bowels, extra exertion of the muscles has been required to propel the dung to the rectum, and cholic or cramp (spasms) of the bowels, has followed, or a course of continued irritation, or of continued cholic, or both, has ended in inflam-

mation of the bowels. I remember a beautiful farm-horse, which, owing to the distance of part of the farm to which he belonged from the buildings, was worked the long hours described, and finished his day's work before his bait. He was constantly subject to attacks of the gripes, which were subdued; but he died of stomach staggers. The same stable, then so often subject to diseases, is now, by a change in the system, completely free from them. Another case, however, occurred,—a beautiful compact little mare was constantly afflicted by cholic,—she eventually died of inflammation of the intestines.

There are other parts of the management to which horses employed in agriculture are subject, which induce diseases of the bowels; for instance, a boy returning from work, with heated and sweating horses, to save himself trouble, allows them to drink copiously at some pool or stream he passes. Suddenly one or more of the horses exhibit symptoms of gripe, they suddenly lie down, roll about, look at their sides, rise up, seem relieved, and again speedily relapse; the sudden application of the cold water has produced spasms in the bowels, through which it has passed. This is neglected, or perhaps gin or whisky, aided by pepper, is administered as a remedy, and severe and general inflammation of the bowels is the result; this is mistaken for another attack, and again the poison is administered, and the inflammation increased, and death follows. The horse of heavy work, too, is longer exposed to the inclemencies of the weather than the animal of light work. In the former, the rain is allowed to fall upon him for hours, and it is allowed to *dry upon his back*; the sympathy between the skin and the alimentary organs is known to every groom,—obstructed perspiration, and consequent irritability, is conveyed from the one to the other, and disease is the consequence. It is true, the latter is also partly exposed to the rain, but for shorter periods, and the wisp and brush are liberally applied when he enters the stable; a determina-

tion of blood takes place to the skin, perspiration is excited, and disease thus prevented.

There is another disease to which horses are subject, and which is at once the cause and consequence of inflammation of the intestines. I mean intestinal calculi. Inflammatory action of the bowels, like that of every other part of the system which comes in contact with any foreign body, is liable to produce calculi, which in turn irritate the bowels, and produce a lasting predisposition to disease. For this I am not aware that any remedy has been discovered, and what is worse, they generally accumulate with age, and eventually produce death, the only power over them arising in our endeavours at prevention.

Prevention.—Of the best means of preventing these diseases in farm-horses we will now treat. We have attributed the peculiar liability to them in farm-horses to mismanagement, with the exception of certain instances of peculiar formation of the animals, and although the farmer must necessarily work his horses longer hours than the horse of rapid work is capable, there is no necessity of depriving the animal so long of food. No horse should work more than five or six hours without a bait. If we examine the history of the stables of large farmers, whose fields necessarily lie, at a great distance from the buildings, and where they are worked long in consequence, and compare it with that of small farmers, under the contrary circumstances, we shall find a striking difference as respects the health of the animals. The case referred to above strikingly illustrates the truth of this observation. But, it may be asked, how is it possible to bait the animals so far from home? The difficulty seems to be in procuring food upon the spot, for if this is not done, the precaution will be neglected, and, at any rate, the land will be occupied by it. This, however, may be remedied. In the case, for instance, of a field intended for turnips, which has to

be worked during the spring, a part of it, half an acre, or in proportion to the size of the field, may be sown with winter-tares, a few of which may be mown off, and given to the animals green, without carrying them from the field, interfering with any crop, or wasting any time in carrying the horses to a distance. If the field be intended for summer-fallow, the spring-tare will answer, and which may be used in the same manner, instead of allowing the poor animals greedily and indiscriminately to crop the leaves of the hedges at every turning, from the impulse of hunger. There is another easy way of baiting, which some carters adopt, and which might be applied to the farmer's horse, especially when carting. It consists in securing a bag, containing corn, over the animal's mouth and nose, by a string, which passes over the poll, and is locally denominated a "nose-bag," or "horse-poke," and which should be removed when he has finished his feed. To prevent the effects of the wet upon the skin, an unexpensive glazed cloth may be thrown over the horses' backs, and secured to the collar and traces. This may by some be considered very troublesome, but, it will be found, that when it is once begun, it will be considered no more trouble than carrying the rest of the harness, and if disease is prevented, the trouble amounts to nothing. To counteract as much as possible any habits of greedy feeding which the horse may have acquired, his corn should be mixed with chopped straw, or chopped clover, which will secure its proper mastication, and prevent many troublesome complaints, as well as render all the nutrition of the food available. These may be substituted by an admixture of clean chaff with corn, a plan which is pursued in a farm stable with which I am acquainted, and is found a useful practice. It would save the animals much time in eating, if all their food was chopped, and perhaps steamed; but on this subject we have not sufficient data to determine it with accuracy.

94 *On the Inflammatory Complaints of Farm-Horses.*

Cure of the Diseases.—The cure, it has been hinted, must generally be left to the veterinary practitioner in the complicated diseases of the horse ; but I shall refer to the principles of cure, in order to guide the farmer from some errors into which he may otherwise possibly fall. To begin with the most difficult, Stomach Staggers, which is distinguished from Mad Staggers, by the sluggishness or dulness of the animal in the first stage of the complaint ; but from the sympathy between the stomach and brain, the former often ends in the symptoms of the latter. All the efforts of the practitioner must be to empty the stomach ; it is often a fruitless attempt, but a powerful doze of castor-oil ($1\frac{1}{2}$ lb.) may be tried, as being rapid in its effects, and mollient to the hardened food in the stomach. Bleeding may also be useful, in preventing the delirium. In the early stage of the disease, a stomach-pump may be used to wash the food from the stomach ; but here an experienced practitioner alone will be able to do it. Gripes or cholic are, fortunately, generally more easily subdued ; they are distinguished from inflammation of the bowels by the suddenness of their attack, the temporary relief from pain, and the relief obtained from exercise, the symptoms of the latter being directly contrary. Bleeding alone will frequently relieve the spasm, but I have known a very simple remedy used with almost general success. Goose fat, in the quantity of a pound or three quarters given warm, generally produces relief in a very short time, if accompanied by walking exercise. In severe cases, one ounce of laudanum and a dram of powdered ginger, in a quart of warm ale, may be used with probable success.

Inflammation of the bowels is worse to cope with than gripes, and a farmer should never attempt the cure himself. He should call in the veterinary surgeon *immediately*. The disease may be distinguished by a coldness of the extremities ; this at least indicates inflammation, or that the blood is determined to some local part, and the heaving of the animal's

flanks, and his anxious looks at his bowels, as well as their tenderness when touched, will indicate the seat of the inflammatory action. The first object is to relieve the system, and counteract the impetus of the blood; bleeding persevered in until the horse drops, is the only chance for saving his life. There is another principle in horse medicine which here will be called into vigorous action. No severe inflammation can take place in two contiguous parts of the system at the same time. To lessen the internal inflammation, the belly must be largely and powerfully blistered, and these are the two means for subduing the disease. No purgative medicine should be given, but the horse back-raked, to prevent the formation of calculi, and a glyster administered in the form of onion broth. All stimulants must be avoided, as they are sure to act as poison to the animal. In conclusion, I would impress upon the persons concerned, to aim at *prevention*, where their efforts will generally prove available, for they seldom are so in the curative process.

DESCRIPTION OF AN IMPROVED SHAKER FOR THRASHING-MACHINES. *By Mr DOCKER, Findon; and Mr RITCHIE, Mill of Melrose, Banffshire.*

[The Silver Medal was voted to Mr Docker, and also to Mr Ritchie.]

THE improvement about to be described, has been brought before the Society by two different individuals, each of whom claims the priority of the invention; and both reside in Banffshire, in the neighbourhood of each other. The one produces the evidence of an original letter, dated 4th April 1829, from the millwright employed by the gentleman to whom the invention was first communicated, in which letter distinct reference is made to the leading principle of the new shaker. It appears also, that some progress was made towards the application of it to the thrashing-machine of the gentleman alluded to, but, owing to some change of circum-

stances on the part of the millwright, the invention was not carried fully into operation. The other party, as appears from sufficient authority, has invented a shaker, on the same principle as the former, and had it put in actual operation in a thrashing-machine, in the early part of the present year, 1837, and which shaker has given great satisfaction. In publishing this improvement, it is not intended to enter into the merits of the priority of the invention; but seeing that the two claimants have hit upon the same principle, though they adopt different modes of communicating motion to the parts constituting the principle, the Society has adopted the following description, from models and drawings furnished by both claimants. Mr Docker, who claims from 1829, has furnished one model and various drawings, from which the figures in the plate have been chiefly taken, only, because it appears to be a method less loaded with friction than the others. The other claimant, Mr Ritchie, has furnished two models, in which the medium of motion differs, not only from the former, but from each other. These are illustrated by separate cuts.

It is well known, that in thrashing-machines, revolving shakers or rakes are universally employed, which in general perform the operation rather by a species of rubbing than of shaking. The improvement now suggested dispenses with the revolving rakes, and substitutes in their place an apparatus that, judging *a priori*, will certainly be considered as possessing the requisites for performing the operation in a very perfect manner. It has the advantage, as will be seen from the description and figures, of being really a shaker.

The principle involved in this improvement, consists in having a number of battens, or splits of timber, arranged in a position parallel to each other, and at the same time horizontal, and occupying nearly the same space in length and breadth usually allotted to the revolving shakers in the thrashing-machine. The battens are arranged in two alternate series, that is to say, suppose there are 24 battens numbered

1, 2, 3, 4, 5, 6, &c., the numbers 1, 3, 5, &c. form one series, while the numbers 2, 4, 6, &c. form another. Each of the series is combined by an apparatus which gives it a motion of such a nature, that any *point* in the battens describes a circle in the same vertical plane. The motions of one series alternate with those of the other, that is to say, while any point in the first series is describing the superior half of its revolution, a similar point in the second series is describing the inferior half of its own revolution. The superior half also of the revolution in each series is in one direction, while the inferior is in the opposite, from which it will follow that any substance, as straw, if laid upon battens moved as here described, will have a progressive motion communicated to it, the progress being performed by a saltatory motion. A reference to the figures will better illustrate the improvement and its mode of action.

Plate VI. Fig. 1, is an isometrical view of part of a thrashing-machine, exhibiting the frame-work and gearing immediately connected with the improved shaker. Fig. 2. is a geometrical elevation of the same, the front framing being left out in order to shew the internal arrangements; the letters of reference apply to the corresponding parts in both figures. A A, are the cross beams in the barn floor, broken off, and B B, the longitudinal beams upon which the framing of the drum and shaker (as in the common form) is built; C C, are the posts, and D D, the bearing and other rails of the framing, the post C' is broken off, and the drum *a*, Fig. 1, is shewn in dotted lines, both, for the purpose of exhibiting the lower gearing of the shaker. The letters *b* mark the first series of battens of the shaker in the superior part of its saltation; *c*, the second series in the inferior part; *d* are the upright rods or pillars that support the one end of the battens of the first series, and *d'* the rods of the other end; *e* and *e'* are the corresponding rods of the second series. The battens are attached to the top of their respective

rods, while the lower ends of the rods are inserted and fixed into the transverse bars, 1, 1, and 2, 2. The first series of battens, *b*, along with its rods *d* and *d'*, and its transverse bars 1 and 1, are thus formed into a rigid system of parts, while the same thing holds in respect to the second series and its corresponding parts.

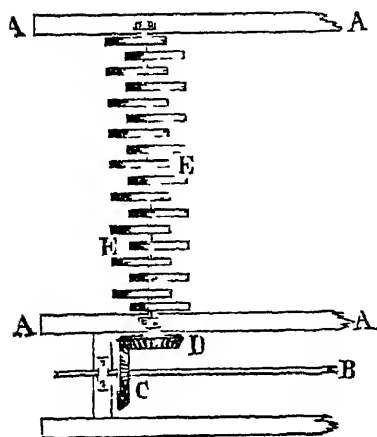
The gearing for giving motion, consists of the following parts:—Two T-shaped vibrating levers, *f f*, mounted on the shafts *S*, are buckled together by means of a connecting rod jointed to them at *g g*; there are also jointed to them at *h h h h*, the connecting rods *i i i i*. The vibrating levers *f*, and the connecting rods *i*, are repeated on the opposite side of the shaker framing, the connecting rod *g g*, being obviously not required on that side. The gudgeons in the ends of the transverse bars 1, 1, and 2, 2, are received into eyes in the lower ends of the eight connecting rods *i i*, &c., whereby the two series of battens partake of the motion communicated through the levers and connecting rods. These last receive their motion in the following manner. A shaft *j*, having a two-throw crank at *k*, and a single crank at *l*, receives motion by a belt or otherwise from any convenient part of the machinery of the mill, a connecting rod *m* is jointed at one end to the crank *l*, and at the other end to a lever *n*, fixed upon the axis of one of the vibrating levers *f*; the revolving motion of the crank *l* thus gives a vibratory motion to all the levers. The proper motion of the two series of battens might yet be imperfect, but it is rendered complete by the connecting rods *p* and *q*, working upon the two-throw crank. The bent connecting rod *p* works in one part of the double crank, and is jointed to a transverse bar of the first series of battens, the straight connecting rod *q* being in like manner jointed to the other part of the double crank and to a bar of the second series. The proper adjustment of these cranks require that when the double crank is vertical, the vibrating levers *f*, must all have one end at its greatest elevation, the other end being at its greatest depression; under this arrangement the

axes of the transverse bars 1, 1, 2, 2, will describe circles of 6 inches diameter, and by consequence, any other point in either system will do the same.

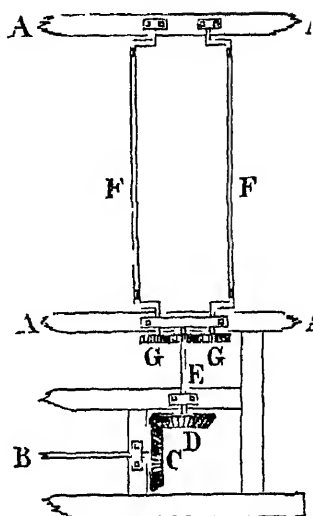
Such is a mechanical description of this improvement on the shaker, but in order to enable farmers, millwrights, and others, to avail themselves of it, the following details may be useful. The battens may be of the full length of the space usually occupied by the revolving shakers; they are about 3 inches deep by 1 inch in thickness, and set at about $2\frac{1}{2}$ inches from centre to centre. Each batten is armed with a row of spikes about $1\frac{1}{2}$ inches in height, inserted into the upper edge of the batten to enable them to carry forward the straw, or they may have a double row of spikes in each, standing obliquely, the better to prevent straws falling through. The cranks by which the series of battens are moved, have a radius of 3 inches, or an entire throw of 6 inches, which gives the straw an advance of about 6 inches for every saltation. The crank shaft may make from 80 to 100 revolutions per minute; but this will depend somewhat on the velocity of the feeding rollers, for the shaker must remove the straw at such a rate that it cannot accumulate upon the battens, but should rather be spread out upon them. As it has been found that the power required to work a shaker of this kind is considerably less than is necessary for the revolving shakers, the whole of the shafts, levers, cranks, &c., may be comparatively light; for example, a crank shaft of $1\frac{1}{4}$ inch square has been found sufficiently strong for the purpose.

As the modes of communicating motion to the new shaker may be varied according to taste and circumstances, the annexed cuts exhibit two methods recommended by Mr Ritchie. No. 1 is a plan of that method which he has put in practice, though probably not the best; A is the side framings of the mill, the space between being occupied by the shaker; B is a shaft running parallel to the framing, and which is put in motion by a chain or otherwise from any convenient part of the ma-

No. 1.

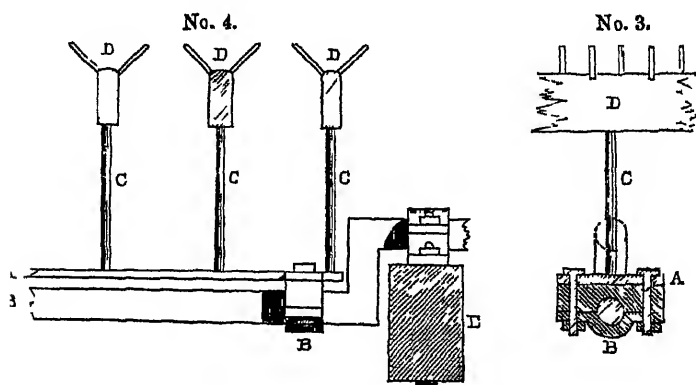


No. 2.



chine. Upon this shaft is mounted a bevelled wheel C, working into another on the end of the cross shaft D. This last shaft has a number of eccentric pulleys E, mounted upon it, equal to the number of battens in the shaker, the pulleys are so arranged that they stand forward and backward alternately. A strap is fitted to each of these eccentrics, and the battens of the shaker are attached to the straps. Those battens which are attached to the forward pulleys form one of the series, those to the backward pulleys the other series, and constitute the gearing for one end of the battens. Conceive now the shaft B prolonged to a proper distance, and another bevelled wheel similar to C set upon it, working another wheel and shaft corresponding to D, which is also mounted with eccentric pulleys placed in the same relative positions as on D. To this let the other end of the battens be in like manner attached; the arrangement thus completed will produce a motion in the two series of battens precisely similar to that already described. No. 2. represents another method of producing the same effect, which again represents only one half of the gearing. A

is the framing, B the driving shaft carrying the bevelled wheel C, which acts upon the wheel D, mounted on the short shaft E, the opposite end of which carries a pinion of 5 or 6 inches diameter. Two shafts, F F, cranked to a radius of 3 inches, extend across the framing, one end of each carries a pinion G, of the same size with that on the shaft E, and works into it. These long cranks F, have journals formed at each elbow, and upon these are fitted bars standing in the place of the transverse bars described under Fig. 1, Plate VI., and like them carrying upright rods to which the battens are attached. These are shewn in the annexed cut, No. 3, wherein A is a cross section of the bar, the crank with its pillow block, and the rods for supporting the battens. Cut No. 4, is an elevation of the same parts with the crank in the upright position, E being a section of the beam that supports it. Conceive, again, the shaft B, cut No. 2, prolonged as before, and the same gearing repeated as has been just described, this combination will produce as before an arrangement that will bring out the same motions as described for the others, care being in this case taken to attach the battens of one series to the right hand cranks F, and the other series to the left hand cranks.

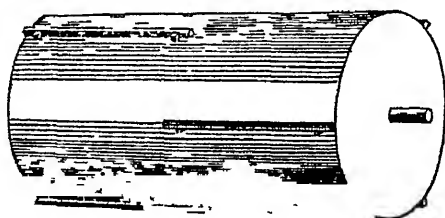


It may be necessary to remark, that in Figs. 1 and 2, Plate VI., no part of the ordinary machinery is shewn, the drum only of the upper works being represented in order to identify relative positions, nor are any of the lower apparatus,

as fanners, &c., represented, no change in any of these parts being required on the introduction of the new shaker. To prevent confusion also, one half the number of battens only are shewn in Fig. 1. The expense of altering a thrashing-machine to introduce this improvement, has been estimated at L. 7 or L. 8; it is probable that the expense may ultimately be L. 10.

Mr Ritchie has also communicated an alteration, which he has for some years acted upon with success, on the drum of the thrashing-machine. It consists in a method of placing the skutcher or strippers on the drum. Instead of the skutchers extending the whole length as in common practice, he places them in half lengths, the halves at the one end being placed intermediate to those of the other end, as represented in the annexed cut, No. 5. This alteration, by lessening the extent of the individual strokes given by the skutchers, and doubling their number, is supposed to reduce the effect of the shock which the machine receives at every stroke of the skutcher.

No. 5.



DESCRIPTION OF A SEED-SIFTER, OR MACHINE FOR CLEANING RYE-GRASS SEED. *By Mr LECKIE, Haddington.*

[Three Sovereigns voted for Model.]

MR LECKIE, who is a practical seedsman, had long felt, in common with others in that line, the great difficulty and labour experienced in separating rye-grass seeds from the va-

rious other seeds with which it is liable to be mixed. He had made many experiments with a view to accomplish this object; and, in the course of them, had observed, that wire-cloth of 16 meshes in the inch, had the effect of separating from the rye-grass seeds most of those that are considered as deteriorating, when mixed with the former. A sifter of a simple form was tried and found to answer, which induced an extension of the principle; and now, after several years' experience, the machine has been found most efficient, and is now used by some of our most eminent seedsmen.

Plate VI. Fig. 3, is an isometrical view of Mr Leckie's machine in its complete state, as at present in use. A A are two posts 5 inches by $2\frac{1}{2}$ inches (cut off at top for want of room in the plate), but which should reach to, and be fixed in the joisting of the apartment; these posts serve, together with a cross rail S, to guide the sieve-frame. Two other similar posts B B, reaching also to the joisting, serve to carry the machinery of the sifter. This consists of a wheel of about 15 inches diameter, mounted on a shaft of $1\frac{1}{4}$ inch square, having a winch-handle fitted to it. Below this is another similar shaft, carrying a pinion of about 3 inches with a crank of 3 inches radius, and a fly-wheel 3 feet in diameter of about 80 lb. weight; a connecting-rod R, 3 feet in length, is also fitted to the crank: these constitute the gearing of the machine.

The sifting-apparatus consists of the two sieve-frames C C, connected together, at the distance of 9 inches, by four iron pillars D D; to the lower frame is hinged the sloping sieve E, which is a light deal frame, and covered with wire-cloth 16 meshes in the inch: the angular space at each end, between this and the lower sieve-frame, is closed with canvass. Two other sieves F F, each 6 feet in length by 3 feet in width and 5 inches in depth, having deal sides, are fitted to go easily into the upper and lower frames, where they are supported on small filletings, and held firm in their position by means

of pinching screws passing through the end of the sieve-frame. The upper sieve is formed with wire-cloth of 12 meshes in the inch,—the middle one being 15 in the inch.

The sieve-frames thus mounted are suspended by the four iron rods G, attached to the joisting above by swing-joints, and to the frame below by hook-and-eye-joints. To keep the frame from swinging irregularly, a slide-rod of about 12 inches in length is fixed in each end of the cross-rail before described. To this the sieve-frame is bound by means of two slide-hooks, leaving it at liberty to swing freely in the direction of its length, but confining it from any other motion.

The connecting-rod R being now hooked into an eye in the end of the sieve-frame, the winch is turned by hand to put the machine in action. The rough seed is put into the upper sieve, which, by agitation, allows the rye-grass and smaller seeds to pass through, while husks and larger seeds are retained. The former are received upon the middle sieve and subjected to a second separation in which the fine rye-grass, dust, and small seeds only are passed through. These, falling upon the lower or sloping sieve, are again separated, the dust and small seeds fall through this as waste; and the rye-grass seed in a clean state is discharged over the lower edge. In many cases the middle sieve may be laid aside, and the upper and lower only used. In all cases, it is proper that a smooth board, more than half the breadth of the lower sieve, should be hinged to the lower front-edge of the sieve-frame, sloping in the reverse direction of the lower sieve. The seeds falling through the upper sieves, are received upon this board, which leads them towards the higher edge of the lower one, and subjects them longer to its agitation.

As this machine appears to be of considerable importance for the cleaning of grass seeds generally, it is suggested that means should be adopted to render it more commodious or even portable; an improvement of which it is certainly susceptible.

PLATE VI.

Fig. 1. Agric. Soc. Trans. Vol. VII.

IMPROVED SHAKER

Fig 1

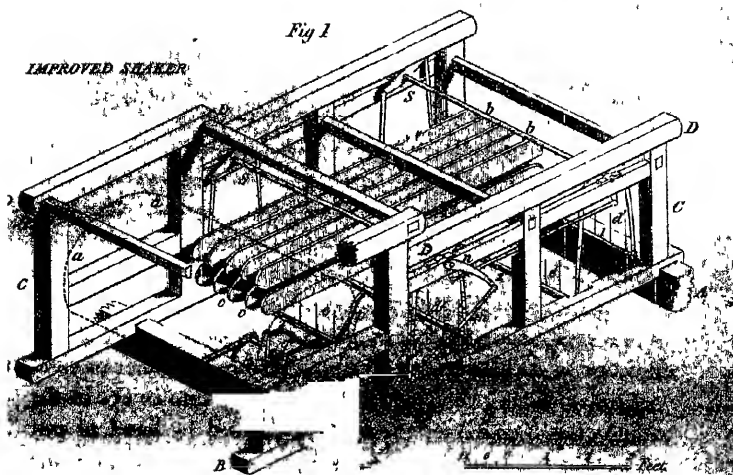


Fig 2

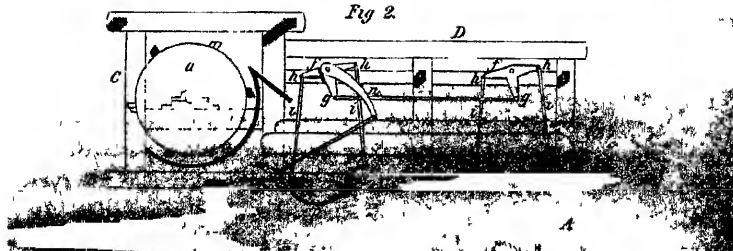
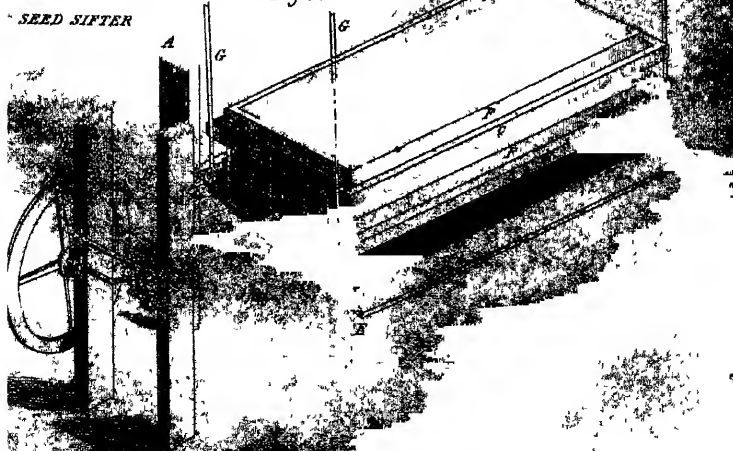


Fig. 3.

SEED SIFTER



ON THE TREATMENT OF SHEEP WITH A VIEW TO THE
IMPROVEMENT OF THE FLEECE.

ESSAY I.—By Mr JAMES DICKSON, Edinburgh.

[The premium of Twenty Sovereigns was awarded for this essay.]

As I conceive that the improved Leicester breed of sheep is the most valuable in Great Britain, I shall, in the first place, confine my remarks to them, and shew how they should be treated throughout the year, in all states, to insure the greatest weight of mutton with the finest quality of wool.

1. *Treatment of Tups from weaning till aged.*—There is a material difference to be observed in the treatment of Leicester tups, according as they are intended for sale or otherwise. When intended for sale or hire, the young sheep require much higher feeding than when only intended for the use of the breeder's own flock. It is then not so necessary to have young tups so full of condition as when they are to be shewn to the public, when their points and wool should handle, and appear to the best advantage. For the latter purpose, all the tup lambs, after weaning, should be put on good clover foggage or other rich feeding pastures, and for a time, as soon as the harvest admits, on clover stubble, where they may be kept till the 1st of October. If the weather is dry, turnips may be given them on the stubble; but if wet, a clean grass-field should be selected for the purpose of beginning them with turnips. A few old sheep should be put among them to retain them to break the turnips. As soon as frost sets in, they should get clover hay in small racks; white turnips and hay will suffice till about new year,

when they should get cut Swedish turnips, given them in boxes. A small quantity of bruised grain, say $\frac{1}{2}$ lb. for each sheep per day, should also be given. On all these they should be kept till April, great care being taken to observe regularity of feeding and in affording shelter. About 1st of April put them on new clover, continuing the cut Swedes and bruised grain till 1st of May. They are then clipt. Unless the pasture is of rich feeding quality, continue the bruised grain till the time of sale or hire, which may be about the latter end of September. In this treatment, Leicester shearling tups will show and handle well. If, on the other hand, the breeder intends them for the use of his own flock, I should not recommend such high feeding. The same feeding as the fattening wether hoggs receive should make them sufficiently strong and vigorous when put to the ewes about the middle of October, that is, when they are about nineteen or twenty months old. After they have finished the season with the ewes, which should never be later than 20th or 25th of November, they should be immediately put on full turnips, either netted on the land, or given on a lea-field, a little hay being also given them; and in the following spring put on good feeding pasture. Leicester two-year-olds, or aged sheep, feed so fast that it is not necessary to give them grain or extra feeding; as by doing so, they would become too fat and useless. Two-year-olds and aged tups may be kept together; but tup-hoggs should always be kept by themselves. No tups should be used above five or six years old, unless a first-rate sheep, as they get small stock. A shearling tup will serve eighty ewes with safety; but fifty or sixty are enough for an old sheep; and the less travel any tup has, the more ewes he will serve.

2. *Treatment of Leicester Ewe-Lambs, from Weaning till they are put to the Tup the first time.*—From weaning, ewe and wether lambs should have the same treatment till 1st of October, when the latter are put to turnips, on clean feeding pasture, clover foggage and stubble. The ewe lambs intend-

ed to be kept for stock may then be selected with safety, as their points and quality of wool will be fully developed. After selection, they should be kept on good pasture till November, or longer if the weather is fine, but whenever frost or bad weather sets in, they should be put on white globe turnips till February, which if sliced so much the better. After this, should the white turnips be spoiled by frost, or run to seed, a few cut Swedes will keep them growing and preserve the lamb-layer or flesh, which should be studied to be preserved in all young sheep. About the beginning or middle of April, fresh grass of two or three-year olds will suffice, for it is unnecessary to give ewe hogs the best feeding pasture. By this encouraging treatment they will be in fine condition, good substance, and desirable size, at clipping will cut a sound fleece, and, with similar treatment through the summer, will reach the tuppings season in good trim.

3. *Treatment of Ewes from the period of Tuppings to Lambing.*—For three weeks or a month previous to ewes and gimmers being tupped, they should be kept on good pasture or rape, the gimmers being either mixed with the ewes, or kept separate. I would recommend them being kept separate, as tups can then be selected to suit the peculiar points or condition of both ewes and gimmers. The better keep they both have at this time, the more equal and sure will be the conception, which always not only insures a good crop of lambs, but early and regular lambing. Many breeders, knowing the beneficial effects of good keep at this time, although attended with the dangers of making ewes too fat, give them rape or turnips, and fine crops of lambs have thereby been produced, particularly from feeding with rape. The late Mr Wilson of Preston, Berwickshire, generally pursued this plan, and never failed having great crops of lambs, and regular and early lambing; frequently more than one-half of his ewes bearing twins, and part three and four lambs, Mr

James Read, Drem, East Lothian, tried the experiment of feeding with rape, and found the ewes have a larger crop of lambs than when tugged on grass. Unless the weather is very severe, ewes may be kept on pasture from being tugged to the middle of February, if it is in such a state as to keep them in fair condition. They should have turnips for at least a month previous to lambing, if the pasture has been eaten bare; and if the weather is severe through the winter, it will be necessary to give them both turnips and hay to carry them through to the lambing time in fair condition, but they should by no means be too fat, as high condition is almost as dangerous to ewes when about to lamb, as too lean a condition. Their condition should be such as to make them flush of milk when they drop their lambs about the 10th of March. On dry land they may be netted on turnips previous to lambing; but on wet, they should get them on a grass field, as ewes heavy in lamb are apt to over-reach themselves when sinking deep into the land, and in consequence throw their lambs. Shepherds should be very careful of ewes at this time, when the most laborious and irksome duty they have to perform is about to commence. If appropriate preparations are then neglected, great loss will be incurred in lambs, and most probably also in ewes. The farmer and shepherd should consult together some weeks previous, and make arrangements for the accommodation of both ewes and lambs. The first should be the saving of a sheltered, dry, old grass-field, with a southern exposure, in a rough state of pasturage, during the winter, as near the steading as possible. Into this the ewes should be put at the commencement of lambing, and plenty of turnips given them on the grass; temporary straw-cots should also be erected in the best sheltered corners of the field, well bedded with dry straw, in which the ewes and new dropt lambs may be kept confined for a day or two, or longer if the weather is bad. Twin lambs should be soon removed to new grass, where temporary cots should also be erected for shel-

ter, and turnips given the ewes on the new grass. Ewes with single lambs may be kept on older pasture, and on turnips, Swedish or the best kind of Aberdeen yellow being the most nourishing for milk, which should be cut and given in boxes. If a supply of milk is not kept on the ewes for the lambs, the latter will become stunted in their growth, and from which check they will never recover. If ewes are not full of milk at and after lambing, and should the weather be severe, many lambs will certainly die, but with proper shelter and plenty of nourishment, it is wonderful how young lambs withstand the inclemency of the weather. Besides food and shelter, it is the duty of the shepherd to tend them night and day, as Leicester ewes, when lambing, must never be left alone, for few of them lamb safely without assistance, so the closer the flock are kept together, they will be more under the eye of the shepherd. Assistants, according to the size of the flock, should be provided for the shepherd, besides powerful lanterns for seeing the flock, when going through them during the night.

There are many other duties besides tending which the shepherd should perform. Should a single lamb die, a new dropped twin must be taken away from another ewe immediately, and put to the bereaved ewe, confining them both in a narrow dark place. The skin of the dead lamb should be rubbed over the head, and even sewn over the body, of the fostered lamb, to imitate the smell of her own lamb. The ewe being full of milk, will take the substitute in less than twenty-four hours. As soon as she becomes kind to it, they may both be turned out among the flock. The shepherd should take all superfluous wool from the udders of the ewes before lambing, and observe after lambing, that the single lamb sucks both teats, for if the ewe is full of milk, and this circumstance not attended to, only one of the teats will probably be sucked, and the other of course become blind, and hence the usual cause of ulcerated udders. Lambs should besuckled immediately after being lambed, and kept dry, in the

cot from rain. If they get wet, with an empty belly, stiff joints and other diseases almost instantly attack them. It very frequently happens that gimmers, and very high bred Leicester ewes, have little milk at lambing. This being the case, the shepherd should always have plenty of warm cow's milk at his command, in fact, a good milch cow should be kept for this purpose, where there is a large flock of ewes, to which he can have access by night or day, as a little warm milk and warmth will save a lamb when nothing else will. Ewes in this state, or with weakly lambs, should be placed in a dry warm court or house in the steading, till they recover their milk, or the lambs their strength. The tup lambs should be castrated in fresh weather, when eight or ten days old, as it is dangerous for them to be cut in cold frosty weather. The tails of both wether and ewe lambs are docked at this time. Lambs for tups are usually kept from ewes selected at tupping, having the most perfect symmetry, best wool, and good handling. These are served by the best tup of the flock, or probably by a hired one from another flock. The breeder sometimes keeps a few fine looking tup lambs from other ewes, but this is not a safe method of selecting tup lambs, and their pedigree may not be so correct. As the lambing season advances, the ewes with twin lambs are distributed over the new grass fields, and those with single lambs over the older pastures, but if all enjoy the new grass, so much the better; to which should be added, if possible, through March and April, if the season is backward, cut Swedish or yellow turnip in boxes. But if there is plenty of early grass, there is less occasion to give them turnip after March. It should, however, never be forgotten, that good keep will make good sheep and a valuable fleece; and that if lambs are well attended to for the first six weeks, their constitution will be strong, and they will be supplied with lair juices, and furnished with substance, and which treatment, if followed up for the remain-

der of the season, will ensure superior carcass, tallow, and fleece.

4. *Treatment of Ewes and Lambs till Weaning.*—Ewes and lambs should be continued on good pastures till weaning time, about the middle of July ; Leicester lambs are occasionally weaned before this, in the first week of this month ; but as Leicester ewes have great aptitude to fatten, the draft or cast ewes have sufficient time to fatten on good foggage or pasture, before the end of September, and the flock-ewes be in excellent condition before the tupping season in October.

From May to weaning, the washing and clipping of the sheep occupies a great part of the shepherd's attention. The washing of ewes should be performed with the greatest precaution, as much serious injury may be done them by heating in driving to the washing pool. The lambs, too, being taken away for the time, makes the ewes irritable on the road. Farmers should themselves always superintend the washing and clipping, and be assured of the security of the lambs in the absence of the ewes.

5. *Best Mode of washing Sheep.*—It is a question whether the washing of wool is best performed on or off the sheeps' backs. I am of opinion it is best done on the back of the sheep ; and the fact that the wool of Leicester sheep is almost unsaleable when clipt unwashed, shews that the wool-staplers are also of the same opinion. I have known many lots of fat sheep clipped unwashed, before being sent to London, and other markets, and their wool sold with difficulty at a reduced price, whereas when washed, it sold very freely. Neither stapler nor manufacturer will buy unwashed Leicester wool by weight but at little more than half the value of well washed, the weight of unwashed being fully a third heavier than washed. But I am compelled to say, in accordance with observation, too much of it is washed in a very slovenly and careless manner, and too little attention bestowed on preparing an article of so great national im-

portance. The washing of sheep in the south of Scotland and north of England commences about the 1st of May with Leicester tups, fat wethers, and hoggs, and with ewes from the 1st to the middle of June. A clear running water with a clean gravelly bottom is best suited for the washing of sheep, its depth should be about $2\frac{1}{2}$ feet, and as broad as to permit three or four men to stand about 6 feet apart, the outer men being about the same distance from the sides. When a natural rivulet does not afford such accommodation, a damming will be required to be made across it to retain the water to a proper depth and breadth. The sheep should be inclosed at one side of the water by nets or hurdles, so as to be easily laid hold off, and handed to the first washer; they should be very slowly driven from the pasture to the inclosure prepared for them at the water-side, in the cool of the afternoon, after the water has been heated by the sun. When the business begins, the sheep should be gently handed, one by one, to the first washer in the water, who turns it on its back in the water with the head out of it, taking it by the near fore-leg with the left hand, and by the wool on the neck by the right, and swilling it to and fro and up and down in the water for a short time; he then hands it to the next washer, who goes through the same process, and so on to the last washer, who should be the shepherd himself, and who must be very particular in squeezing the wool on the back and sides till thoroughly rinsed. He then turns it over in its natural position towards the opposite side of the water it was taken hold off, plunging it over the head, and causing it to swim to the shore. On landing, the water runs from the wool, and in a little time the sheep shakes off the remainder as forcibly as if twirled from a mop. By this process the wool will be very well washed. If the flock is large, three or four men should always be in the water, and a change of men take place every hour. The sheep should be very slowly driven to a clean pasture-field, free of broken banks, the rub-

bing against which would again soil the wool. If immediately clipped when dry, the wool feels hard. A short period of six or seven days should clapse to permit the return of natural yoke into the wool, when it will feel more smooth and soft, and weigh more; and in this state it is better liked by the manufacturer, for whom I have purchased wool on commission, besides growing it on my own account. I am of opinion that some improvement might be made in washing wool on the sheeps' backs. I think the use of soda would be of advantage. This might be done by placing a large tub at the water side filled with water, holding a solution of soda, into which every sheep, before being handed to the first washers, might be immersed. The soda, I have no doubt, would loosen the yoke, and facilitate the cleansing of the dirt from the wool. The expense of this operation would be trifling, and the experiment is worthy of trial. Besides washing benefiting the wool, I consider the sheep themselves are the better for it. We have only to observe how clean and comfortable a sheep looks after being shorn of a clean washed fleece, and, on the contrary, how dirty and uncomfortable it looks after being shorn of an unwashed fleece, to be sensible of the benefit of washing. It is also impossible to clip an unwashed sheep neat or close, and one dirty sheep will spoil the shears more than a number of clean.

6. *Best Mode of clipping the Wool off Sheep.*—Wool must be ripe and ready to part from the skin before it should be taken off; nature thus preparing it for the hands of the shearer. The natural symptom of shedding the wool depends much on the feeding; some high fed sheep will be ready for clipping in March or April, whilst others not well fed, will not be ready till June. The mode of clipping sheep was performed in a very awkward and clumsy way in the Border counties, till within the last sixty years. The new and much approved system was introduced into Northumberland by the late Messrs Culleys of Akeld and Wark, who were also the

first to introduce the improved breed of Leicesters into that county. The old mode consisted in tying the feet of the sheep and laying them together on a stool, and clipping almost at random, in a longitudinal direction, making very rough work, leaving, on an average, fully an inch of wool on the skin, and in some places more than two, and great tufts hanging in all directions. This awkward and unprofitable method was often performed by women, and is still continued to be practised in many parts of Scotland. The method introduced by the Messrs Culleys, and now practised in all the well-managed sheep districts in Scotland, is what may be called clipping in the annular or circular form. The sheep is held loose, the clipper placing it on its rump, and shedding the wool on the under part of the neck, commences clipping round the top of the neck to the top of the shoulders; he then clips the belly down to the extremities of the hind-legs, shedding the wool to the right and left; he then clips from the thick part of the near fore-leg, continuing in parallel rings over the shoulder, ribs, and loins, up to and along the top of the back; he then drops the sheep on its side, and bending his knee over the back part of its neck, rests the toes of his left foot on the ground, in the inside of the neck below the jaws. This position is easy, both for himself and the sheep. He continues the circular form over the hooks, as he continues to pass over the hip or thigh, bringing the rings neatly up to the line of the back-bone. The rings or shear-marks are generally from a-half to three-fourths of an inch apart, and about one-third of an inch from the skin. The near side being thus finished, the clipper raises his knee from the ground, gets on his feet, and the sheep again set on its bottom, when the same process is repeated on the off side as was on the near, making the rings join neatly on the top of the back, as if the shears had passed over the back with the same hand. Some good clippers indeed go right round the back without stopping, but the former is reckoned

the neatest plan. Some clippers use the right and left hand successively, and others the right hand alone, but it is immaterial which, provided the work is neatly and well done. The hand which for the time is unemployed should be laid flat on the bare skin, to draw it towards the clipper; the tighter the skin, and the clipping hand held nearer the skin, the neater the work. The wool should always be carefully collected together, to prevent the sheep breaking the fleece with its feet, in kicking or striking, which some sheep, under the thralldom, do. A clean lighted place, and sheltered from rain, should be selected to contain the sheep, and clip them in. The clipping floor should be made soft with straw, and covered with a strong canvass barn-sheet fastened tightly down. A woman or boy should be employed among the clippers, removing any droppings from the sheep, sweeping the sheet with a besom, picking up locks of wool, and carrying away the fleeces to be rolled up. 'To clip twenty Leicester hogs or fat sheep, or thirty ewes, well per day, is fair work for one clipper.

7. *Best Mode of rolling up, and preserving the Fleece for a length of time.*—An experienced person should always be employed to roll up wool. The first process is to clip all hardened dung suspended from the tips of the fleece, leaving nothing in the fleece but clean wool. The observance of this precaution is not only the best policy for the farmer, but is his safest course, as a high penalty, by act of Parliament, may be levied against all persons wrapping up dirt in wool. This is a wise regulation, as it is quite impossible for a wool-buyer to examine every fleece separately, which he may be inclined to purchase. A clean and convenient place near the clipper should be chosen for the rolling up the fleeces; a large square board or plain deal door, raised about two feet from the ground, answers well to spread the fleeces on. The inside of the fleece is placed next the board, then the belly and other straggling portions of it are thrown into the inside of the fleece, the

breadth of the rolled fleece being made according to its size. A large heavy fleece requires to be rolled up about thirty inches in breadth, whilst a small one need not be more than sixteen to eighteen inches. The rolling should commence at the hinder part of the fleece, taking care to keep it uniform in breadth in rolling up, and pressing it rather firmly. When it is rolled to the shoulders, draw out the neck-wool and twist a band from it, of sufficient length to go firmly round the fleece and fasten the end into the band. A fleece thus rolled up may be carried, stored, packed, unpacked, and lodged in the warehouse of the stapler, without being broken; but too many fleeces are put up in a loose careless manner, and easily broken and injured. The rolled fleeces are then neatly stored in the wool-room, every description by itself, as it comes to hand. Some wool-growers practise the unavailing expediency of placing the best fleeces in the front of the store, no doubt with the view of making the whole store appear as if it contained none but the first-rate wool; but the stapler soon discovers the deception, and, of course, is induced to turn over more wool than he would otherwise do; and should he not purchase it, the owner is put to much unnecessary trouble in replacing it in a favourable position for the next customer.

Wool should be kept in a dry, close place, and however close it is kept, if dry, it will increase in weight, and not deteriorate in quality. It will keep for years quite safe, if vermin is precluded from it, particularly rats, which are fond of making their nests in it. It will even keep a long time in the pack without injury, if kept dry. Granaries near slate roofs are not good places for keeping wool, as in them it becomes hard, and loses in weight. If kept for any length of time, it will be necessary to turn over the fleeces at least every six months.

8. *The Best Method of packing Wool.*—The first consideration in the packing of wool, is the quality of the pack-sheets, which should be strong, whole, and sound. The sheets should be slung by ropes near the wool store, from the beams of the

house, or other fixtures. The ropes are fastened to the two open corners of the sheet, in each of which a stone is placed, and around which the ropes are fastened in loops. When thus slung, about eight or nine inches from the ground, two men enter into the sheet, and commence laying a row of fleeces across the bottom, from one close corner to the other, always taking care to have the corners and ends tramped hard as the sheet fills. The pack should hold about 16 stones of 24 lb. each, or about 27 stones imperial, if well sewed up at the top. If the sheet has thus been firmly packed, it will reach its destination and be unpacked without a broken fleece; but if loosely and confusedly packed, the fleeces will come out broken and bruised, and will thereby incur to the stapler a great deal of trouble in sorting, and even when sorted, they will never reassume the natural appearance they had before being rolled and packed; and as the stapler has all his sorted wool to expose for sale in his warehouses to his customers the manufacturers, it is the readiest way for growers to obtain the highest prices for their wool, whether in brisk or flat markets, to be particularly attentive to its management in all the different stages of washing, clipping, rolling, storing, and packing. Growers of wool may depend upon it, that wool-staplers are very intelligent men of business, and there is perhaps no class of men who require and exhibit more judgment and discrimination in dividing the different qualities of the article they deal in. Besides being a thorough judge of wool being well washed, and well managed in every respect after being taken from the sheeps' backs, a wool-stapler can judge whether the sheep whose wool he inspects has been well or ill fed, and indicate the defect at first sight, although it may not be perceptible to another person not a judge of wool. If sheep have at any time during autumn, winter, or spring, been pinched of food for even a few days, the staple of the fleece becomes weakened at the very place where its growth has been checked for want of the requisite nourishment. The defective place may be detected

by the experienced eye, but by any one taking the staple by the ends, and giving it a sharp pull asunder, it may certainly be detected, by its breaking or drawing out smaller at the very place or places where the nourishment was wanting when those places were next the skin. I have seen a staple give way in three or four different places. As the quality of Leicester wool is chiefly valuable for its length answering the purpose of combing, and of course making all those kinds of woollen manufactures which are made of combing wool, and for which no substitute can be found in wool of any other length, it is clear that it is the grower's interest to preserve the uniform strength of the staple by uniform good feeding. Leicester wool, to be valuable, should therefore be long strong, fine, and soft, and to obtain with certainty all those requisites, the sheep should be uniformly well fed, and the wool, after clipping, managed in the best manner in every respect. The want of feeding, even for a single week, may not only deteriorate the carcass, but lessen the quantity, and lower the quality and value of the fleece, 20 to 30 per cent.

9. *Treatment of Ewes from the Weaning of the Lambs to their own Topping.*—In weaning lambs from the ewes, they should be removed as far asunder as to be beyond the hearing of each other's bleatings. The ewes must be milked three or four days, taking care they be not heated in the process. The milkers should draw every teat clean, only once a-day, for oftener than that would retain the milk on the ewes almost as fully as if they were sucked. At the last time the milk should be drawn very clean off, when the udders will soon get dry without injuring the ewes. Perhaps it might be proper to allow them to retain their milk for nearly two days previous to the last milking, by which I am sure they would get sooner dry. As soon as the ewes are dry, the old ewes which are to be drafted, should be taken from the flock to be fattened. Leicester ewes being sold at four years old, the draft is the fourth part of the ewe flock. The gimmers supply the

place of the old ewes. The draft ewes should then be put on the best feeding pastures, on clover foggage, if any to spare, and if well fed will be fit for the butcher by the end of September, good ewes usually averaging about 20 lb. per qr.; but if kept till New Year on rape or turnip, I have known the best weigh 28 lb. to 30 lb. per qr. They should never be retained later than Candlemas, as I have observed they improve in no respects after this season. The regular ewe flock may be kept on their summer pastures till the middle of September, when they should have fresh grass or rape, to prepare them for tupping, as has been already pointed out; but should they shew a great predisposition to fatten, they should be kept on inferior pastures from the weaning of the lambs until near their own tupping, for I have often known ewes become so fat in this short time, as to prevent their conceiving. The ewes of Mr Thomas Darling, West Fortune, East Lothian, get so fat, that he is obliged to keep them on the worst land of the farm. They were kept this year on hay and water in the court-yard, and still they are full of condition.

10. *Treatment of Wether Lambs, from weaning till they are sent fat to market.*—Wether lambs should be put on the best pasture immediately after being weaned, and continued thereon till about the 1st of October, when they should have turnips in a lea-field for the first month. A few old sheep among them will teach them to break the turnip. They may then be netted on the turnip land, or continued on the lea. If they are netted on, it should be, in the first place, on the driest and best sheltered spot, and, if possible, with a southern exposure, in order to have it always to resort to in case of stormy weather, as they proceed along the field, in regular breaks of fourteen days' feed. A new break should be given when the former one is half eaten, the bottoms of which should be picked up, and the sheep will return and eat them up clean. They may continue on white globe turnip till the New Year, after which they should have cut Swedish in boxes. The shepherd, and a boy or woman with an

improved turnip cutting-machine, can cut for from 300 to 400 hogs. Straw is usually given when on turnips, but when the weather is in the least severe, clover hay should be given, and continued through the winter. The cut Swedish turnip and hay should be continued till 1st April, when they should have new grass with cut Swedish, till 1st May. I am, however, of opinion, that the new grass might be saved from pasturage, by adopting the feeding on grain or oil-cake. Suppose half a pound per day, of bruised oats, were given to each fattening wether hogg for six months, or 180 days, that would be 90 lb. to each, or about 2 bushels at 3s. per bushel, or 6s. each. Suppose this extra feeding increased the weight of each hogg 2 lb. per quarter, or 8 lb. on the carcass, at 6d. per pound, is 4s., with 2 lb. of extra tallow, at 4d., is another 8d., and 1 lb. of extra wool, at 1s. 4d. per lb., making in all 6s., which is just the value of the oats repaid. This result shews no pecuniary advantage gained by this mode of feeding, but this important object is gained, that wether hogs could be so fed without touching grass at all, until the 1st of May, when they could be clipped, and sent ripe to market 20 lb. per quarter; whereas, if they are only fed on turnips, they cannot attain the same degree of weight and ripeness till June, after they have eaten new grass for two months. By the feeding I propose, the new grass can be saved, in fact, for the ewes and lambs, which is a matter of great importance, besides the bringing a heavier carcass to market at an earlier period, with more tallow and wool of superior quality. The purer the breed of Leicester sheep is, they possess the greater aptitude to fatten, and the more highly they are fed, they come the sooner to maturity.*

* Mr John Dudgeon, Almond Hill, West Lothian, has fed hogs through the winter on turnips, 1 lb. oil-cake, and $\frac{1}{2}$ lb. oats each; and on 15th February 1838, they averaged above 130 lb. each live-weight, which, when reduced to dead-weight by the decimal .605, they weigh at this moment not less than 19 $\frac{1}{2}$ lb. per quarter.

11. *Effects of Climate and Food on the Wool of Sheep.*—My opinion as to the effects of climate, situation, and food on the wool of sheep, is, that after having been a breeder of Leicester sheep, and purchased considerable numbers of them from Northumberland to the northern counties, and from personal observations made while travelling in that line, through almost every county in Scotland, which I have had occasion to repeat this year, I cannot perceive any effects of climate on the wool of Leicesters, judging of climate from a difference of latitude in this portion of the island. I examined a large flock of them in Caithness, the property of William Horne, Esq. of Scouthel, and I could see no perceptible difference between their wool, and that of the flocks they are descended from, the property of Mr John Wilson, Simprim, Berwickshire. I also examined the clip of Mr Horne's sheep of this year, which I considered equal to Berwickshire wool, both as to quantity and quality, some of the hoggs' fleeces weighing 7 lb. to 8 lb. I consider the whole flock equal to many of the best in the south of Scotland, both in point of mutton and wool. Some shearling tups had just then arrived from Mr Wilson, and on comparing their wool with those of Mr Horne's own breeding, I found the quality of both very nearly alike. Difference of situation, in regard to altitude, has a material effect on wool; and different descriptions of soils grow different kinds of wool as well as grain, but Mr Horne's land in Caithness, and Mr Wilson's in Berwickshire, are, however, much alike, being mostly clay, and this description of land will grow a much stronger pile of wool, than light gravelly or sandy soils, although the latter will grow it finer. Good feeding seems to be the grand means of growing the heaviest and most valuable fleece, inasmuch as it is fit for combing and for the manufacture of goods of strong and durable texture. No wool-stapler ever finds fault with wool being too heavy, if produced from high feeding, and the pile naturally fine. There are sheep called Leicesters, and other long-woolled va-

ries, with heavy wool, but of coarse quality; but the wool of improved Leicesters is soft and of fine texture, and the more highly such sheep are fed, the more valuable per lb. is their wool to the manufacturer, and of course more profitable to the grower. I recommend all breeders of Leicester sheep to select full-woolled sheep, with a fine soft texture of fleece, not too open, rather close as otherwise, and with a high tone of blood; and if such are treated as I have pointed out, breeders will always be insured of the greatest quantity of wool of the most valuable description, and the most valuable carcass for the butcher, and the younger such sheep are fed, the greater quantity and better quality of wool will be produced.

To shew the effects of difference of situation and food on the wool, I once divided a lot of Cheviot lambs, when weaning, into two, and put the one lot on full keep on low grounds, and the other to a green hill farm. The latter got no turnip, but still came through in fair condition, their fleeces weighing about 3 lb. each, worth 1s. a pound, 3s. The fleeces of the other lot that got full keep weighed 5 lb. each, worth 1s. 4d. per pound, 6s. 8d. The high fed wool being fit for combing; while the other being short and tender, was only fit for secondary clothing wool.

12. *Treatment of Half-bred Cheviot Sheep.*—The treatment of crosses from Cheviot ewes and Leicester tups should be conducted with the same care and attention as Leicester sheep, to insure good mutton and a valuable fleece, although it is scarcely possible to attain the same degree of perfection from any half-bred sheep, they being usually kept on inferior land and higher situations. Turnips being now grown on all lands, where half-bred sheep are kept, I can see no reason why they should not be encouraged by good feeding as well as Leicesters; making allowance of time in their arriving at maturity, from the difference of blood. This cross will produce wool of *finer* quality than Leicester, and being combing wool, is more valuable per pound.

13. *Treatment of Cheviot Sheep.*—The black-faced breed

long took the lead in occupying all the mountain-ranges of the north, from a notion that they were much hardier than the Cheviots ; but long and fair trials have proved that Cheviots are also a hardy race ; and now the greatest part of the mountains of Caithness, Sutherland, Ross, and part of Inverness, are stocked with Cheviot sheep of the very best description, and which are not only quite suited to the northern climate, but the land is as competent for their maintenance, for they thrive admirably. When Mr George Culley of Akeld, wrote his observations on *Live-Stock* in 1807, he described the Cheviot sheep as being very deficient in the fore-quarters, wanting breadth both there and on the chyne, and that their wool weighed only 3 lb. per fleece, 2 lb., of which was fine and worth 1s. per 1 lb. and 1 lb. coarse, worth only 6d. ; but he sagaciously remarked, that if they could be improved in form, and the fleece rendered equally fine, they would prove a most valuable sheep for high districts, and which, he had no doubt, would one day be accomplished. His hint has not been lost sight of. For thirty years the Cheviots, both in form and fleece, have been much improved, and they are now dispersed over a large portion of the country, and which, along with the new system of light stocking, and improving of arable land by growing turnips, are circumstances that have had the desired effect of bringing them to their present state of perfection. They are excellent feeders, have mutton of fine flavour, and their wool, though short, is fine and valuable, but when made long enough to comb, by good feeding, is the most valuable of all British wools.

Cheviot tups should be selected on the same principle as Leicesters, and fed as highly as the circumstances of the land will permit ; and separate tup parks for the hogs and old tups should always be provided. The tups are generally put to Cheviot ewes from the 10th to the 15th of November, previous to which, for a month at least, and while tupping, they should be well fed. A sufficient store of hay should be

provided for a severe winter. Cheviot ewes should have turnips for a month before lambing ; and during the month of April, they should have turnips strewed on the grass to keep them full of milk. They usually begin to lamb about the 10th or 15th of April. When lambing, they should be tended in as far as the circumstances of the farm will admit. Cheviot lambs should not be weaned before the first or second week of August, as it is in the latter end of July they make the most improvement. In high districts, the ewe lambs, after being weaned two or three weeks, should be pastured along with the ewes, and this plan insures the most healthy ewe stock. The ewes should not be milked more than four or five days after the lambs are weaned. They should be kept full of grass till tupping, as Cheviot ewes cannot be too full of condition at that season, both for securing a good crop of lambs, standing the wintry blasts, coming to the lambing vigorous and strong, and producing a full clip of wool.

With respect to the effects of climate on Cheviot sheep, it is quite plain that, although they are the natives of the Cheviot mountains in the north of England, they have been tried with the climate of the north of Scotland for about forty years ; and although the store-farmers in those wild districts neither did get, or could get, the best stock from the Borders to commence with, yet from their exertions, and judicious selection and management, they can now vie with the Borders for Cheviot wethers, ewes, and wool. A northern climate thus seems to have had no bad effects on Cheviot sheep. Nay, I am credibly informed, that the clips of wool are both heavier and finer in many parts of the north than what they are in the south. This circumstance, I conceive, can only be accounted for from the great quantity of sheep moss-plants which grow early in spring in the high grounds of Caithness, Sutherland, and Ross-shires. These plants are said to be as nourishing as turnips, and promote in a wonderful degree the growth of wool.

14. *Treatment of Black-faced Sheep.*—With respect to the

treatment of black-faced sheep, the same remarks I have made on Cheviots will apply to them. This breed of sheep is the hardiest of all the mountain breeds, but there can be no doubt that the Cheviots are the better paying sheep of the two, if the land is at all capable of keeping them; and there is much land in Scotland yet supporting black-faced, quite capable of keeping Cheviot sheep. They have been much improved within the last twenty or thirty years. We have only to compare the black-faced wethers now brought to Falkirk with those formerly shown there from Lanarkshire and Peeblesshire. The improved breed are round in the carcass, and well-formed, with clear, bright, and mottled faces, fine round horns, and clean legs. They are spread all over the high land. Their wool has been much improved of late years by judicious selection of tups, light stocking, and better management. I consider land will keep more black-faced than Cheviots. The latter being longer-sided, eat more food, although they fetch higher prices, both for carcass and wool. Excellent specimens of sheep have been produced by crossing them with the Cheviots, and still more so with the Leicesters, the latter being a splendid cross, the carcass being very handsome and compact, and completely suited to the London trade. In both crosses, the wool is very much improved.

To recapitulate briefly what I have endeavoured to enforce: Sheep with the most useful qualities of wool must be selected by the breeder. Good treatment and good feeding are absolutely necessary to bring both the carcass and fleece to maturity. Although I am not of opinion that climate, at least the difference of climate in Great Britain, has any material effect on wool, yet different situations, and different kinds of food, produce difference in wool. Moss plants produce heavier wool than plants growing on light thin soils. Rape produces heavier wool than turnips, and broad clover heavier than white. All these nourishing plants produce not only heavier and broader wool than those from light soils, but softer in the tex-

ture, and longer for combing, for which kind there is always a great demand.

15. *Salving of Sheep*.—The practice of salving sheep in high situations, to protect them from the inclemency of the weather, is a very old one, and was, until within the last twenty or thirty years, entirely performed with tar and butter; but the high prices obtained for white wool above that of salved for some years past, have induced many store-farmers to try a variety of new salves composed of different substances, many of which have proved a failure. A few of them have succeeded to a certain extent. Those made from cocoa-nut oil, olive-oil, and turpentine, are said to have stained the wool the least, but many of the new salves stain the wool as much as the old method. In consequence of this, many wool-growers who tried the new salves are now returning to the tar and butter, giving a larger proportion of butter, and mixing them well together; but too much tar is still used, is not thoroughly mixed, and laid on the sheep in a very careless manner. Great care should be given in applying the salve, the wool being shed clean, and the salve laid on regularly, close to the skin. By such care, the wool will be much less stained than if carelessly done. It is also necessary, even in low situations, and with feeding stock, to use certain liquors to kill the vermin which naturally breed on sheep, such as the kid-tick and sheep-louse. Tobacco juice and spirits of tar or turpentine, are generally used for this purpose; and as all sheep are subject to vermin, so all sheep not salved should be run over with some such liquor in the end of autumn before putting them on turnips. The proportion of tobacco liquor to that of the spirit of tar or turpentine is as twelve to one. Sheep that have been driven are apt to become itchy after being put on good keep. Running them with the liquor after they have come off the journey, will prevent any outbreak on the skin. It is the duty of the shepherd to attend to all these particulars in the management of sheep, but the

farmer should also be skilled in them, in order to be able to keep the shepherds at their duty. When shepherds know their duty, and perform it attentively and conscientiously, there is not a more valuable and useful class of men, as servants, belonging to the agricultural profession; but however useful or attentive they may be, it is the duty of the sheep-farmer at all times to keep a watchful eye over his shepherds and his flocks, for it is only by so doing he can insure to himself a fat sheep and a valuable fleece.

ESSAY II.—*By Mr A. GALL, Glendrissaug.*

[Five Sovereigns were awarded for this Essay.]

I HAVE the management of a property in the west of Scotland, which produces a stock of Cheviots remarkable for the fine quality of their wool. They were originally a small native grey-faced breed, somewhat like Shetland sheep, the wool being much finer than the common black-faced breed. About twenty years ago, the finest woolled Cheviot rams that could be procured were put to these ewes and changed every second year. The stock is now pure Cheviot, but not of a very large size, the ground on which they are fed being of a light dry nature. The wool brings a very high price; the year before last, it was sold white at 40s. per stone of 24lb., last year it brought 26s. 6d. smeared in the common way with tar and butter. This year's clip has not been sold, but a price has been offered for it equal to the highest market price of pure white Cheviot, and it is smeared with a new salve, consisting of what is called light tar and cocoa-nut oil.

As to the treatment of tups throughout the year, they are kept on good pasture till within a month of the time for admitting them to the ewes, when they are put into a shed or house, and fed on oats, turnips, and hay. This answers the double purpose of putting them in the best possible con-

dition, at the same time, that there is no danger of their breaking out to the ewes during the night. They are admitted to the ewes about the 15th of November, a week later or earlier according to the season. After serving the ewes, they are again put on house-feeding till the grass is up, when they are put on good pasture, where they are kept till required next season.

The ewes, after being tupped, are put upon pasture that has been preserved for most part of the summer (which is partly common heath pasture, and partly good grass land) till the beginning of February, when they are put upon Swedish turnip, where they remain till they begin to drop their lambs, when they are removed to the most sheltered and farthest advanced grass lands on the farm. The Swedish turnip has a most beneficial effect in producing a full flow of milk, from the first very favourable to the young lambs. There is no particular treatment of the ewes and lambs till the period of weaning, farther than giving them plenty of good grass and not allowing them to be in any way disturbed. The lambs are generally weaned on the 12th of August. The best of the ewe lambs are marked for stock, and the whole are put on clover stubble, where they remain till the approach of winter, when they are removed to some other good pasture or put on turnip. The ewes are milked twice at intervals, of forty-eight hours each time, after the lambs are weaned, which prevents the milk producing any bad consequences from its gorging in the udder. Milking twice is generally found quite sufficient for this purpose. After this they are put to their ordinary pasture.

In about a month, a sixth part, being the worst, are drafted out and sold for turnip feeding, and their place is supplied by young ones which are kept. In the end of October the ewes are smeared. I have tried every substitute recently proposed, and for the climate of the west of Scotland, I have no hesitation in saying, that smearing ought always to be

adopted. Soon after smearing, at latest by the 15th November, the tups are admitted to the ewes.

The hoggs are, as before stated, put on clover. This superior feeding is partly for the purpose of supplying the place of the mother's milk, and partly to prevent sickness or braxy, to which young sheep are well known to be very subject. I have rarely seen any die when kept on clover or turnips. The hoggs are smeared generally a week before the other stock, and kept on the best winter foggage and turnips till the young grass is ready for them in spring.

As to washing wool, there is no doubt that it can be more effectually done off the sheep's back than on, since the manufacturer, in every instance, requires to wash the wool before using it, however well this may have been done on the sheep's back. This process, however, being part of the manufacture of wool into cloth or other fabrics, is peculiarly the department of the manufacturer not the grower, and is always left to him. The object of the grower washing wool I understand to be for the purpose of removing sand or other impurities which might add to the weight of the wool. This can be done perfectly well for all economical purposes on the back of the sheep, and at infinitely less expense than off. The manufacturer, on the other hand, wishes the wool more for the purpose of rendering it perfectly white, and unless the grower was acquainted with the various liquids used for this purpose, that is, understood so far the manufacture of wool, his labour would be lost, as the manufacturer would still require to subject the wool to the purifying process, however well this may have been previously done in any ordinary way, or by uninitiated hands.

I have always been in the habit of washing wool on the sheep's back by plunging them two or three times through a deep pool in a running stream, and allowing them to dry thoroughly before clipping.

I believe the best way of clipping is lengthways : it is far more expeditiously done, and in a few days looks quite as well as the other method of clipping in rings from the neck downwards. The fleece ought to be spread out on a large table, or raised board, and firmly rolled up with the clipt side outmost. The best mode of packing I believe to be in sheets, suspended from the rafters of the woolhouse, and well tramped by two stout men in each packsheet.

It must be kept in a house perfectly dry, and, at the same time, cool. If so treated, it may be held on, as has been repeatedly done, for several years.

In judging of the quality of wool, the property which is most generally attended to is its loose free texture. This always prevails where the wool is of the Leicester or Cheviot or other fine breed, and the animal in good condition ; whereas, on the other hand, the wool of the black-faced breed is often so matted together, that it is difficult to separate it. Such fleeces are always coarse and bad. Long firm grain, at the same time that it is soft and silky, is the most valuable property of wool, and can only be judged of by the eye. It is well known that there are five or six different kinds of wool in every fleece, which are separated and arranged by the wool-stapler, the finest kind being next the neck, while the coarsest is at the tail. It is a pity that wool-stapling is so little practised in this country, as it is obvious that were it more attended to a greater profit could be made from sheep.

With reference to the effect of climate and food on the wool of sheep, we must look to the provision of Nature for animals generally. Of all the domesticated animals, sheep are more in a state of nature, and less subjected to the artificial treatment of man. It follows, therefore, that their covering is suited to the climate of the district they inhabit and varies with it,—the wool getting finer as the climate gets better, and coarser as it gets worse. It is well known that New South

Wales produces the finest wool in the world, and in no country is there so fine a climate.

In our own country, I do not apprehend that the difference of climate in its various districts produces of itself much difference in the quality of wool, but I have no hesitation in saying, that pasture has a considerable effect on the quality of the wool. Where the land is of a deep marshy nature, the wool of sheep fed on it is invariably coarse of its kind; while on the other hand, if the land is dry and the grass sweet and delicate, the wool is always fine.

ESSAY III.—*By Mr WILLIAM HOGG, Shepherd, Atterstone, Peeblesshire.* *

[Ten Sovereigns voted for this Essay.]

THERE are sundry natural obstacles to the improvement of wool; and, being so, are beyond the ingenuity of man altogether to overcome. There is, in the first place, a high and stormy situation. A farm of this description requires a strong hardy animal to pasture it with advantage and safety. The strength and abilities of a stock must be proportioned to the general temperature of seasons experienced in that district; and to this right adaptation of the animal to the soil and climate, all other considerations must submit. If wool or any other point be exclusively cultivated, the stock insensibly loses its competence for the situation, and gradually enters on an unprosperous state, and though the excellency, whatever it is, may be a little more perfectly unfolded, yet wanting sufficient stamina perfectly to carry it forward, soon again disappears; for unless the subject upon whom the experiment is made be kept in a thriving state, no peculiarity, however valuable, can

* To avoid repetition, the remarks of this author on the treatment of sheep and the operations connected with it, which were in exact accordance with those of either of the authors of the two former papers, have been omitted.—EDIT.

permanently be established in it. That this is true in practice will appear when the storemaster sets about improving the wool, and this he can do only in one of three ways, either by selecting his own fine coated lambs, or annually purchasing strange lambs, or admitting tups of a finer variety to his ewes. In the first case he must invariably choose the smallest of his lambs, for a fine smooth coat is constantly and steadily essential to the feeble part of the flock; and when the prime of every year's produce can with difficulty survive the rigours of a long winter, with what prospect of success can the small and feeble part be expected to outlive its privations? In the second case, he brings a constitution formed from and entirely adapted to another soil, generally from a warmer climate, where feelings are assimilated to a milder and clearer sky, and its taste to more succulent feed. And in the last case it gradually communicates a different constitution from what the pasture naturally gives; and in all the three cases those important points which fitted the animal to the situation are neglected, and an improper stock unsuited to a pasture can neither thrive nor be productive.

But elevated pasture frequently exhibits a few peculiarities which also oppose the production of good wool. On some farms moss prevails to a considerable extent, and sheep, especially when newly clipt, rub this substance with great keenness among their wool, where it remains for a season, absorbing the juice of the fleece, and injuring its pile by making it dry, stiff, and unmanageable in its after sortings. Another evil is the excess of moisture which invests all elevated tracts. The rains and mists which often fall and long hang among high mountains, gives the wool a bluish or soiled hue which never leaves it. Immoderate rains also wash away much of that natural sap which pervades the fleece, and the presence of which is a principal excellency of all good wool. Another inconvenience, not indeed essential to positive altitudes, but flowing from it, is, that all sheep pasturing a high and shelterless farm

ought to be smeared with the old mixture of tar and butter. This salve more effectually excludes wet, cold, and drift than any of the new invented unguents, but it gives the wool a black and dirty colour, which never leaves it till it is in the dye vat, where it prevents the fixing of the right colour.

There are local circumstances, however, which somewhat mitigate the influence of altitudes on the fleece. Where the pasture is soft and grassy, it is possible to make quantities of hay, which is a great benefit to sheep in stormy situations; or where the pasture is surrounded by a range of high hills protecting it from the cold snowy points, and spreading with an open easy slope to the south. On such situations some little deference may be given to the amendment of the wool; but pointedly and distinctively to cultivate this or any single peculiarity whatever, operates to efface every desirable peculiarity, and ultimately to the suppression of those it was meant to establish. Thus there are some of the obstacles to the production of fine wool in high situations, which are unalterable in their nature, and others which cannot easily be obviated. The stock should, therefore, be brought to suit the climate, and not the wool of the stock to suit the taste of the storemaster; and I really think that the wool raised under the former circumstances is the most profitable that can be cultivated, for what the fleece may want in quality it has in quantity.

The treatment of sheep is very simple, and the less complicated it is the more valuable. Some of the hill pastures of Scotland are little more than one hundred feet above the level of the sea, while the base of the hills on others are at least two thousand. These various pastures are believed to be stocked with the most suitable breed, and the most appropriate variety of that breed which it is possible to apply to them. Now, give those various stocks ease or quietude, and abundance of feed, and all is done for them that can be done to secure both their own health and a heavy fleece, and I think the most profitable one; but still, through all these gradations

of altitude, the fleeces of the respective stocks *might* be made *finer*, but as the change approached the headlands of the country, the alteration would be doubly hazardous, not so much in the diminution of weight on the wool, as in overlooking the general nature of the animal, and trying to call forth a single peculiarity more abundantly than is consistent with other more important properties of its nature.

I am writing with reference to mountain sheep, and to wool shorn from them. The case is quite different, if we take a part of these stocks and give them turnips: there is then a rapid accumulation of flesh and fatness, and an immediate increase of strong burley wool, not so fine as that grown in the same time on the mountains, but the fleece is not so deficient in other desirable qualities as in the smallness and softness of the fibre. There seems to be such a plentiful accession to every secretion, that they are not properly elaborated previous to their being taken up as nourishment, and hence we find that mutton fed on turnip is not so juicy and marbled as that fed on its native hills; the fibres of the former are coarse and stringy, and has rather an oleaginous taste. Indeed, by whatever means sheep acquire a hasty increase of flesh, there is always a corresponding augmentation of the fleece, but no improvement in its fineness. Through all the pastoral counties in Scotland, there are scarcely two farms on which the wool is of equal fineness, the fleeces of equal weight, and the piles equally thick set on the pelt; yet the wool on each distinct farm has a general character which sufficiently designates its value to the wool-merchant. Nay, on one farm few fleeces will be found equal in fineness, weight, and juiciness; but I acknowledge I never could find sufficient reason to account for this diversity of wools. It is likely, however, the difference does not proceed from a single cause. Though not obvious to the human capacity, it is probable that the secretion which nourishes wool is more plentiful in some pastures than others. Of this we are certain, that in general cases, all verdant easy-

lying pastures produce wool both fine and good ; while mossy coarse land, with a fatiguing range, yield it always in a very inferior state. Again, we are certain that external circumstances operate powerfully on the fleece, and that there are scarcely two pastures on which these incidents do not differ ; and external causes in constant action on the fleece are quite sufficient to change the properties of wool, and generally for the worse. Indeed, when it is considered how wool is exposed to the constant and severe changes and influence of the atmosphere, susceptible of being tainted by pollutions from the soil and by severe and prolonged winters, its growth often checked by an undue depression of strength and vigour in the animal which produces it, we should rather wonder how the sheep stocks in Scotland annually produce a fleece so entire and uniform, as be disappointed that it is not more perfect than it is. In short, where the strength and abilities of the stock are commensurate to the exposure and altitude of the farm, they secure the heaviest, healthiest, and most profitable fleece ; but when the fleece, especially on high pastures, is cultivated as a distinct concern, the subject which produces it dwindles into insignificance, and can exhibit no permanent excellency whatever.

There is vanity and absurdity in attempting to propagate a tender race of sheep on high and exposed farms, or which is the same thing, to cultivate a fine-woolled breed on shelterless and stormy pastures ; and if this important point in store-farming is rightly and duly considered, it will at once account for the fact, which holds good through all the country, that wool of fine quality is never found on high situations, nor wool of debased qualities on low grassy pastures, except in cases of neglect or mismanagement ; and if this fact is attended to, it plainly imports that there would be something in climate which overrules the production of wool, either directly upon the substance itself, or in a mediate way upon the animal which affords it ; yet it is not climate simply considered

that can have influence over this substance, the accidents inseparably from a high climate having a powerful effect both on its growth and quality. These accidents of climate already adverted to are altogether distinct from any inherent tendency in the breed to produce fine or coarse fleeces, for they act equally powerful on all kinds of fleeces, from whatever description of sheep they are taken. Though wool, by its constant exposure to boisterous and changeable weather, may be supposed to have a fixed property that almost resists injury, yet it is in reality extremely susceptible of impressions from external circumstances, and these circumstances, again, are perpetually changing, and never alter in a similar manner through two succeeding years; hence different crops of wool shorn from the same stock, on the same pasture, differ much in their suitableness for the purposes of life.

If wool shorn from mountain sheep were analogous in its growth to that of mountain herbage, it would infallibly demonstrate that climate, unassisted by any other cause, had a decisive influence over the production of this substance. A stalk of bent or sprig of grass is differently furnished on the mountain's brow to what it is on its base, perhaps 2000 feet lower. But wool is quite differently circumstanced from the several grasses of the mountains: the grass springs from its native soil, stands among its kindred grasses, and during its growth is subjected to no other changes than what is occasioned by the heat or cold, the damp or dryness of the atmosphere, these at different degrees of elevation, acting with smaller or greater intensity, yet at every point they only prepare the plant for completing its growth and perfecting its seeds; but, on the other hand, during sultry weather, to elude the direct rays of the sun, the wool is carried by its wearer to every place of defilement, where it is dabbled in mud, in mire, in moss, in gravel, &c. till the fleece can hold no more; then when boisterous weather occurs, the sheep are driven before the blast into linns, dens, hollows, scaurs, or sud-

den excavations in the surface of hills in which there is no green cleughs, or green hastily shelving banks towards a rocky track. In such places they are huddled together by hundreds, by scores, by tens, and frequently, if the tempest be very fierce, I have seen one dragged from the rest, and forced to shelter itself in a bush of heath, and sometimes at the side of a rock no larger than itself. In every successive tempest the wool acquires a tarnished, sometimes a reddish hue, which never after leaves it.

I believe it to be within the compass of man's ingenuity to improve wool almost to the fineness of cotton, but before it could be brought to this state, the subject upon which the trial was made would be so exhausted by a direct improvement of a changeable peculiarity, that it would be nearly useless for any of the purposes of life. The cultivation of wool is unessential to the vitality of the animal which wears it, and the power of subsisting in life, and even with such a degree of power as to enable it to overcome the difficulties and privations which untoward seasons oppose to its existence, must be confirmed in the creature. There is no peculiarity whatever can be made permanent in a race of sheep, if its establishment disable the creature for resisting the hardships and rigours of the climate.

With regard to the qualities of wool by which it may be most easily judged, smallness of fibre is one of the principal properties of good wool. Not to mention the ease and readiness with which it is managed in every stage of its manufacture, we all know that cloths of a silky feel is a prime excellency, and that that is one of the surest tests it has been composed of wool of the best quality. Softness in the fibre is another good property, which although no doubt proceeding partly from the former excellency, yet sundry wools sufficiently small in the pile feel hard or rough to the touch, indicating inelasticity of fibre, or injury by some extraneous substance which has been long in contact with the fleece. The unpla-

bility of the fibre is constitutional in some stocks, and to individual sheep in every stock ; but in most cases it is caused by the qualities of the soil, over which the animal ranges for food ; all calcareous soils securing this defect. A very good property of wool, and which enhances its value much is, an oily and yellowish juice plentifully impregnating the fleece when newly shorn. This beneficial sap no doubt partly dries away, but much of it is absorbed by the wool : the presence of this generous fluid expedites all the operations which the wool goes through, and let the colour be what it may, communicates to the fabric, when finished, a shining glossy surface.

The presence of this in the fleece also indicates the animal and fleece to be in a healthy thriving state. A property of carding wool is, that each fibre assumes a waved-like appearance in its growth. This shrivelling quality disposes the piles to coalesce with one another, and by their linking together form a fine transparent texture, and the thinner this texture can be produced, so much the longer thread will it yield, and the cloth made from it partake of a proportionable degree of delicacy.

But every fleece shorn from the back of a sheep contains wool of different properties, is adapted for different purposes, and goes through processes quite different in the manufacture, and the fabrics, when completed, are totally dissimilar to one another. Clothing wool requires staples short and fine, worsteds require a length of four inches, the hose trade will take it at eight, sometimes below four inches ; and it often happens that wool suited both for the card and the comb are found in the same fleece, and as the demand for combing or carding wool predominates, the wool, though not of the most appropriate kind, is often taken for the purpose.

In former times the wool-stapler transacted business immediately with the farmer, and the wool, while in his possession, was often sorted previous to its passing into the hands of the

manufacturer ; but, except in some cases, the wool-merchant now forms a distinct occupation between the storemaster and wool-stapler, and these merchants, I find, have different methods of disposing of the fleeces in the sheet ; hence the farmer has no opportunity of now hearing the complaints of the stapler, though I should think they might in some instances be well founded. I allude to the preposterous and careless manner in which wool is sometimes put into the sheet, and though the merchant always presides at the operation, and has power to check any irregularity, and his orders would be promptly and readily obeyed, he seldom interferes. I cannot but think, before the fleece reach the wool-stapler, they must be in a very unsortable state ; but as the storemaster hears no complaints, he cannot himself be expected to propose emendations.

With regard to the treatment of tups, they ought to be kept in full habit throughout the year, and if this can be attained without artificial feeding, so much the better ; if not, a month or five weeks on young grass previous to their admission to the ewes, is generally sufficient. Let it ever be remembered, however, that both tups and ewes propagate their likeness, according to their natural shape and figure, when in a medium habit, and not according to that prominence of the principal points which exuberant feeding confers. This appearance is merely adventitious, and contributes nothing to the formation of the new subject ; it is rather a semblance of what man apprehends the creature should be made by his own art, and communicates no influence whatever to the immediate progeny. Yet I wish not to exclaim against a full competence of flesh and vigour in all descriptions of stock, for I know too well the value of having sheep good at Martinmas. The true and safe medium is this : Among all sheep-stocks destined to continue in a hilly district, there are *some* points in the living system less perfect than others, and *after* a succession of severe winters they are apt to fail *entirely*,

that is, settle into hereditary defects. Now, the animals should come through winter in that condition which prevents those points from assuming natural imperfections, for if they be disfigured, and the wool broken year after year with leanness, imperfection is the unavoidable consequence. Particular stocks of sheep which traverse a wide pasture always have some natural defect in their form, a disproportion in some of their parts, which weaken the system. Some individuals have it more than others, yet it will be general throughout the flock, so that I know of no other treatment that can be necessary but that which secures a medium state of condition, such as will prevent a natural or accidental defect from settling into a hereditary deformity.

Hoggs are a little more critical to bring through winter than old sheep, but their particular management depends upon the situation and soundness of the farm. If they can be raised indiscriminately among the flock they are intended to replace, it is the most eligible method, as it preserves all the native instincts of the animals unimpaired, with the additional knowledge they acquire from the older of the stock regarding their daily range, the different kinds of food met with in their course, what kinds best suit the different times of the day, change of weather, places of safety during snow drifts, &c. All those important parts of knowledge they acquire much sooner by observation and conformity of behaviour than if they had gradually to find them out by their own experience. If the pasture be high, shelterless, and coarse, the lowest and grassiest departments should be set apart for hoggs through winter, and although by which means their native perceptions are blunted, and they want the prudence and discretion of the older stock to direct them in emergencies; yet a partial want of what is conducive to their safety may be dispensed with, if it come in competition with their value as proper and elegant stock, which, by a yearly reduction of strength and symmetry, they never can arrive at.

Since the introduction of the Cheviot breed into Scottish pastures, the method of raising large flocks of wether hogs is gone into disuse. These were transferred to English pastures when little more than a year old. In many districts both the breed they belonged to and the methods observed in breeding them are now nearly forgotten ; and, except in a few places where the farm suits the raising and sale of wethers, nothing is now bred but what is necessary to renew the ewe stock.

Many storemasters, where it is difficult to winter hogs, take turnips for them, or for a few of the smallest, and the plan has generally succeeded, but it is at great expense,—about double the cost it takes to rear them at home. For that year the practice insures a full habit of body, and heavy fleece ; but sheep never thrive better through all their ages than when bred on their own pasture.

Wool may be more thoroughly cleansed of impurities when in the fleece than on the sheep's back. The great numbers which some farms hold restrains the farmer from any other mode of washing. It is not reckoned a large sheep farm which holds a thousand sheep, and there are sundry in Scotland which contain four, five, six, and up to eight and nine times that number. It is physically impossible, especially when we consider that the creature at every point of the operation will give every resistance in its power, to wash such immense numbers of living creatures with the hand. I have once or twice in the course of my observations noticed sheep swum through a stagnant pool, or one nearly so. This is a very imprudent measure, for water in a stagnant state always deposits a thick dirty sediment on the sides and bottom of the pool, and the first plunge which the sheep make loosens this incrustation, and sends it afloat through all the mass of water. This ropy feculence attaches itself directly to the fleece, and the sheep actually leave the pool more soiled than cleaned by the operation.

ACCOUNT OF THE MANAGEMENT OF SOME PASTURE LAND IN
THE COUNTY OF ROXBURGH. *By WILLIAM BELL,*
Esq. of Hunthill.

[The second Gold Medal was awarded for this paper.]

THE land to which this memoir relates consists of about fourteen acres English. It is part of a larger portion, of which a general account was given four or five years ago in the *Agricultural Journal*; and it is thought that a statement of the farther progress of the experiment may not be unacceptable, as tending to shew to what extent of productiveness old pasture land may be brought in certain situations.

It is now about twelve years ago since the whole meadow was thoroughly drained. It forms a narrow valley betwixt sloping cultivated land of considerable height on both sides. The ground drained comprised in the whole about 110 acres. The greater part of it was a complete swamp of literally no value. The portion of fourteen acres to which this memoir relates, was the upper and driest part of the whole, but still so wet and overrun with rushes, as to be of little or no value, except for the pasture of a few cows, wading pretty deep in the summer months; certainly it was not worth 10s. per acre. The whole 110 acres had recently been valued at L.12 of rent.

The general drain of the whole meadow intersects the ground in question, leaving about two-thirds on one side and one-third on the other. It was cut through peat originally to the depth of ten feet, and by subsidence has now become about eight feet deep. It was cut down to a narrow seam of sand, which operated effectually as a drain for the whole meadow, insomuch that nothing farther was required on the lesser side than a few covered drains to lead away springs; and on the other a hedge and pretty deep ditch at the commencement of the slope, to cut off springs and surface-water;

and then the meadow was laid sufficiently dry. The exposure of the meadow is south-west and north-east. It is nearly level, discharging the water at both ends; the run had been originally to the south-west, but in process of time the growth of moss had filled up the valley, and forced the level unnaturally up, so that it became necessary to make a deep cut to the north-east, in order to avoid the necessity of cutting through the moss in the other direction, to a depth of at least twenty feet. It lies about three miles from Jedburgh, up the river, and is about 420 feet above the level of the sea. The whole surface is deep moss, superincumbent upon stiff clay, with the thin seam of sand above mentioned interposed, which has been found wherever the drains have been cut quite through the moss.

The first step taken with that portion which is the subject of the present memoir, was to extract the rushes with the common dock spade; and it may be mentioned in passing, that these being laid up in heaps to rot, the richness of the compound proved that the general surface soil ~~was~~ peat-moss, mixed as it formed, with the washings of the adjoining fields of a loamy character, to the depth of six or eight inches, with pure moss beneath.

Looking to the then state of the land, and the richness of the grass then growing upon it, contrasted with the probability that if the plough were used, and the sod broken, the moss below would be reached, and that cultivation by the plough would certainly be difficult, and comparatively not very profitable, it was resolved, for a time at least, to retain the field in grass; and the result of the experiment has been such as to induce the same system to be continued. It is obvious, therefore, that no account can be given of the mode of laying down this ground, which has been upwards of eight years in pasture, which is in fact a natural meadow, and which very probably has never been touched by the plough.

The only other operation worth noting, is, that ~~six or seven~~

years ago, the whole meadow was thoroughly top-dressed with from forty to fifty good cart-load per acre of an accumulation of earth, deposited in a cleuch or runner alongside of it, formed from the debris of the adjoining slopes, and rich in quality, a practice which it is submitted may be followed in many situations with much advantage; but it is necessary to note, that for a year or two afterwards, portions of the ground were quite overrun with docks, obviously from seeds brought down with, and lodged in, the deposite. These were eradicated by hand-weeding.

The field has never shewn the slightest tendency to the growth of musci or plants injurious to pasture, except in one or two spots, where rushes have now and then appeared, obviously from some check in the run of the upper drain, or a want of a slight cross drainage. The whole field is singularly luxuriant, of that deep green colour which bespeaks strong vegetation, and at the same time of a highly fattening quality. Thoughts have sometimes been entertained of applying lime to the surface; but the distance of the kilns and the consequent expense rendered it doubtful whether such an addition would be made to the present high state of productiveness, as to repay the outlay.

For the first three or four years, the ground was used alternately in pasture, and cut for hay. The hay crops generally averaged, sometimes exceeded, 300 stones to the English acre. The state of the meadow in spring, and the rapidity with which it came to a good bite after the hay was cut, has more recently led to the practice of pasturing with cattle till the latter end of May, before the field was shut up. The weight of hay was generally the same, about 300 stones to the acre; and repeatedly the field was ready for cattle with a good bite, after the hay was carried, by the first day of August.

The expense of the improvement of this portion of the meadow, taken by itself, did not exceed 20s. per acre. The general drainage was more expensive, as a considerable length

of main drain was required to lay the other parts of the meadow dry.

It is not easy to specify precisely the various grasses which Nature herself has planted in this meadow. But it may be mentioned, that when the rest of the meadow was about to be laid down in grass, (an account of which was sent to the Society some years ago,) Messrs Cormack Son and Sinclair were consulted, touching the sorts of grass which should be sown, and a description of the ground was sent to them. They sent down a list of a large variety; and as the operation was important and extensive, care was taken to ascertain how this list coincided with the grasses actually growing upon the portion now specially referred to; and upon a careful inspection of the natural meadow, at several different periods of the year, the following grasses in their list were found growing there, a fact redounding to the credit of their skill and discrimination.

Alopecurus pratensis—Meadow foxtail.

Festuca pratensis—Meadow fescue.

Festuca duriuscula—Hard fescue.

Poa trivialis—Roughish meadow-grass.

Cynosurus cristatus—Crested dogtail.

Dactylis glomerata—Rough cocksfoot.

Phleum pratense—Timothy grass.

Anthoxanthum odoratum—Sweet-scented vernal-grass.

Poa pratensis—Smooth-stalked meadow-grass.

Agrostis stolonifera latifolia—Froin.

Trifolium repens—Purple clover.

Trifolium pratense—White clover.

An endeavour was made to save the seeds of the natural grasses in the meadow, by cutting eight different portions, in eight successive weeks, but it did not succeed; either the season was unpropitious, or the locality was not suited for ripening the seeds. Upon trial of all the parcels, only two species of grass sprouted.

There were several other kinds of grasses, the character of which I did not know.

The stock in the years 1833, 1834, and 1835, was twenty-one West Highland cattle, three years old, which fed to forty stones and upwards on the average. They had been wintered in an adjacent park, where a shed was erected for them, and were fed exclusively on the hay of the adjoining meadows, except only that for three weeks in April they got a very few turnips. They were put to feed on the pasture several weeks earlier in spring than the general pastures of the country, and were kept close upon it, except for about a fortnight in summer for change of grass, and the same time in autumn, when the stubbles were opened for pasture; and they have always been brought into such excellent fat condition, ready for the butcher, without any turnips, by the end of October or the beginning of November, as scarcely to meet with competitors in any market to which they have gone.

This year, 1836, the number kept was twenty-three; but a small portion of bean-meal was given to the cattle for some months; and though this may scarcely have been equivalent to the pasturage of the two additional cattle kept, yet it is safer to consider the stock really held by the grass, as only twenty-one as in the preceding years, thus making sixty stones fattened to the English acre in each of the four years.

I venture to add one or two remarks upon the means by which pasture land may be invigorated and refreshed, kept free from surface moisture, and cleared of that moss which in many situations is highly injurious; for it is not more important to lay land down to grass in good heart and condition, than to keep it so, so long as it is retained in pasture.

We are accustomed to admire the rich pastures of which England is so justly proud, but we do not bear in mind that these are procured and kept in luxuriance and vigour at much cost, and with great labour, having periodically spread over them a thick covering of the richest farm-yard manure. I do not defend or advocate this practice. I think it is wastefully extravagant; and that in many situations where we see

it most prevail, the manure might be more wisely and judiciously applied to arable land, which, now that a change has been made in the law of tithe, we shall probably by-and-by see practised.

But I mention the system to put it in contrast with ours. Over Scotland at large, it is rare to see any attention paid to grass lands. Once laid down, it is for the most part left to the care of Nature alone, till it is again broken up for tillage, whether this be in a longer or a shorter period of years. Now and then some favourite spot is top-dressed with lime, and the scourings of the ditches or a head rig dug down; and, considering the great benefit resulting from this practice, in every such case, scanty though such a top-dressing must be, it is somewhat wonderful that it is not more frequently followed.

I have in many instances followed the plan I shall mention on all descriptions of land, and always with great success, accompanied with this further advantage, that each field provides materials for itself, and will do so in perpetuity, while at the same time it is greatly benefited by being laid and kept dry.

The practice is not new, and I mention it only because it is connected with the present subject. It is this:—the furrows of an old pasture field are ploughed out as deep as they can be taken, according to the character of the soil, care being bestowed to give a free run to the surface-water, which thus is passed rapidly away, by spadework at the end of the declivities where necessary:—1st, The removal of the surface-water, thus easily accomplished, is of material consequence both to the quantity, quality, and vigour of the pasture; and, 2d, The earth from the furrows, being gathered and laid up in heaps, of itself forms a dressing of some value to the field; but when lime is mixed with it, the effect is greater and more permanent. I have one field, which, for twenty-one years, has continued to give manifest proofs of the value of this process. The removal of the furrows is not found to be inju-

rious, either to the sheep or lambs, in the pastures, which have been generally Cheviot sheep and crossed lambs from the Leicester.

The quantity of top-dressing is very great, proportioned of course to the breadth of the ridges, as any one will see who will take the trouble to calculate the amount of a cube of five or six inches taken off each ridge ; and the operation may be repeated from time to time ; for, in two years, the furrows, though still transmitting the surface-water, are grown over and partially filled up, and in a few years more, may again, with equal advantage, be renewed ; for, though not so solid nor so bulky, they contain more vegetable matter, and the compost is therefore the richer when this is effectually rotted.

Connected with this point is one, to which I have before briefly alluded. There are few considerable farms in which, in one place or another, deposits of alluvial earth will not be found in the bays of water-courses and elsewhere, affording frequently extensive, sometimes inexhaustible, accumulations of rich earth, at present lying waste and useless, which, employed as top-dressing, after the seeds of weeds are destroyed by frequent turning, would be of essential service to grass land.

Earth thus collected may also be enriched, and the field itself greatly improved, by the manure of cattle pastured on the land being collected by hand labour, and mixed with the heaps. I followed this practice for a certain number of years with great advantage, and if resident in the country, I would unquestionably continue to do so.

I found that the manure so collected, when mixed with from three to five times its bulk in earth, according to the quality of the latter, made a rich and effectual top-dressing for grass land. There was collected, according to the quality of the land, from one and a half to three cubic yards and upwards, of droppings per acre, so that the compound applied, at the

rate of fifteen cubic-yards to the acre, extended across the field by sections for a certain number of years, affording to each part in succession a periodical top-dressing; or, if removed from field to field,—to each field in succession. The gathering was contracted for at elevenpence per cubic yard, and afforded good pay and easy work to old women and children not well suited for harder labour. Greatly more than this expense was saved in the value of the manure, in as far as the whole was gathered up at once, instead of being left to dry and evaporate on the surface of the ground, affording in summer comparatively little or no benefit to the land. Our English neighbours have long been aware of this cause of loss, and they carefully spread the droppings abroad by hand labour, with less actual advantage, and at an expense not greatly less than is necessary to gather and save the whole. From the practice of gathering, this farther advantage accrued, that the tufts of coarse grass growing around each dropping, and rarely eaten by cattle till the next season, were prevented. The fields had all the equality of a well kept lawn, and were all equally pastured and closely cropped.

There is this advantage in these suggestions, that each person may easily try the scheme for themselves at small expense, by experiment on one field. Ploughing and gathering the furrows, and gathering the droppings, is easily done, and the expense may be calculated, and no practical farmer having a large heap of rich earth in each corner of a pasture-field, will hesitate about the expense of turning the heaps, leading out, spreading, and bush-harrowing.

I had a plough made for taking out the furrows; but I found that the common plough, in the hands of a good ploughman, did the work equally well.

The importance of the practice of land being retained in pasture for a greater or lesser number of years, will be enhanced, in the proportion in which it may be thought, that in consequence of the recent change in the law of tithe in Eng-

land, aration will be extended there, in the rich land and genial climate of that country, and that, therefore, the competition with this country, arising unwholsomely and unnaturally under the present practice of rearing and breeding cattle in England to a larger extent than is expedient or profitable, will be gradually abandoned.

I have found marl applied as a top-dressing to grass land, to be productive of more lasting beneficial effects than when applied to land under culture. Land so treated fourteen years ago, still shews the result, in the closeness of the stool, the freedom from musci, and strength of vegetation.

Soot is more of a stimulant than a nutritious application, and its effects are more evanescent. But for several years, it forces vegetation, destroys the musci, and is otherwise beneficial. And, undoubtedly, the ensuing crop of grain is much improved in quantity and quality; and so is the hay crop if the grass is mown. I should be disposed to recommend its application two or three years before a field is broken up, at the rate of from eight to fourteen or sixteen bags to the English acre, according to the lightness or stiffness of the soil.

Although, perhaps, not suitable for the present memoir, and therefore apart from the proper subject of this essay, the following statement is given of the treatment of other land, as peculiarly appropriate to the important question of old pastures, or at least of laying ground down to grass in good heart and condition, and of retaining it in grass for a longer period than under any of the courses of husbandry now practised. However important the general view in question may be, it were to depart too greatly from the matter in hand to enlarge here upon the benefit to be derived, under any course of cropping, from a prolonged use of ground in grass. If it shall be proved that ground can be so used profitably for three or more years, it is for each agriculturist to apply this result to his own particular system.

Having long entertained the belief that a practice of over-cropping has existed in Scotland generally, and in Roxburghshire in particular, and that benefit would accrue both from land being laid down in cleaner and better heart and condition, and also from its being allowed to remain longer in pasture, consideration was given to the manner in which these two objects could be best attained.

A considerable portion of land on the northern slope of the hill, varying in height from the sea from 450 to 600 feet, had been in use to be let in grass, as grass parks, for a series of years together. The soil was various, from excellent turnip-soil to stiffish wettish land, and there were also portions of mossy and portions of thin moorish soil. Of course, the ground varied also in richness as well as quality, from land which would have let at 28s. to 30s. an acre, to what was scarce worth 10s. or 12s. Some required draining, the major part did not. It all required lime, which has therefore been given; where draining was necessary, it too has been applied.

The system followed has been this, the best attention being paid to the various processes.

At one stage or other of the cultivation, according as circumstances rendered it easiest and most expedient, a trench-plough without a mould-board has been used, following the common plough, which merely stirred the earth without turning it over, according to a practice now very generally followed, by which means the good surface-earth was kept above. By this practice, the great advantage is secured, that the ground is universally rendered greatly drier in wet weather, and never scorches, as formerly, in the greatest droughts; besides, that the deep-rooted plants have more space to descend. It is true, that in process of time both lime and the richer particles of the earth may also make their way into the upper portions of this subsoil; but this is a substantial improvement of itself, from which benefit cannot fail to accrue at the next ploughing in after years.

All the ground laid down has been limed. The first crop after the old grass was oats as usual ; this was followed by turnips with dung or bone-dust, drilled. Then succeeded rape-drilled, to which two and a-half cwt. of bone-dust was sometimes, though not always, given. I prefer that the turnips should precede the rape for several reasons.

The turnips were either ate off entirely or one-half, the other being drawn as circumstances dictated, and the rape was of course always ate off with sheep, and lambs, and cattle, in the summer and autumn. Under this treatment rape is a crop which has never failed ; and in a feeding district it is very valuable, for the lambs for a week or two after being taken from their mother prior to their sale, and for the mothers themselves, from time to time in the summer and autumn, prior to going to fat market ; the rape-drilled stands several eatings according to the season, and has prospered under this method, on every sort of soil on which it has been tried. The richer the greater the crop, in some of the best turnip-soils producing a very great crop indeed ; if not allowed to flower, it does not seem to be a scourging crop.

The two green crops in succession appear also to have great influence on the pasture-land afterwards, both in the unfailing luxuriance of the grass at first, and in its clear, and vigorous, healthy state, and fattening qualities in after years.

The rape should be ploughed down early, and on no account allowed to grow in spring. Thus managed, I have never found it difficult to rot the stocks and roots, which, when the crop has been good, must add largely to the manure of the field.

These crops are followed by oats or barley with grass seeds. The grass seeds used have been various, according to the soils ; in all of them Timothy has been freely mixed.

None of the ground has been hayed, but used in pasture from the first ; the first year being reserved for sheep and twin lambs of the half breed.

I do not like the plan of sowing the grass-seeds without a crop. If sown in August, they are apt to suffer in winter ; if sown in spring, they, more frequently than not, suffer from annual and other weeds ; and I am not satisfied that the ideal advantage of missing a white crop, which is undoubtedly an expensive system, is not more theoretical than real, where the land is in high heart. Besides, the want of the second crop of grain is productive, in many cases, of real inconvenience, and compels to the practice of either robbing other land of its manure ; or, where this cannot be done, of purchasing extra-neous manure for turnip at great expense.

Two fields were laid down in the manner described in 1833, and others have followed in succession. The oldest grass has, therefore, been only three years pastured, including the present year, and the results, so far as they have yet gone, have been highly satisfactory. The stocking of only one of the oldest fields can be spoken to with accuracy ; and it has been as follows:—It is 17 English acres in extent. In the first year fifty-one Cheviot sheep with twin lambs were fully served. In the second year four score hoggs were put to it, and this proving insufficient, twenty-one cattle were turned in for several weeks, and the whole were thoroughly well served. This year the stock was fluctuating and variable, owing to peculiar circumstances. It was fully equal to five ewes and lambs to the two acres. The pasture continues to be excellent.

The land has been much more than doubled in value, both in respect to the stock it holds, and in respect to its fattening qualities. As has been said, it does not poach in winter, nor is it scorched in summer ; nor does there seem to be any reason to doubt, that after holding such a stock for a series of years, the ground will be found to be materially and permanently ameliorated when again raised for a crop.

None of the ground has shewn a tendency to fog ; and none of it has, as in ordinary circumstances, deteriorated in the stock of plants in the second or even the third year. It is the

opinion of judges who have examined it with that view, that the ground has been more productive and more valuable thus used, than it could have been under crop, even at better prices for grain than have lately been given.

ON GRASSES CULTIVATED FOR EXPERIMENT IN THE AGRICULTURAL GARDEN, DALKEITH PARK. *By Mr BLACK, Farm-Steward.*

[The Silver Medal was voted to Mr Black for this report.]

SINCE the date of the previous communication, which was laid before the Society by desire of his Grace the Duke of Buccleugh, it has been considered that a short account of the continued culture on the various Grasses there treated of, as well as a concise notice of sorts since added to the collection, may not be altogether devoid of importance. The rich and tenacious quality of the soil, in conjunction with the comparatively short-lived nature of some sorts, have tended to reduce their number, and cause them to be replaced by such others as are indigenous to the soil. Advantage has been taken of these circumstances to ascertain the proportionate durability of the different sorts, and which results have been the more readily attained by the method at first practised, of sowing the seeds broadcast. As, however, the requisite information on this point has now been attained, operations are at present in progress for cultivating, in a more individually distinct manner, a considerably greater number of species than hitherto, as well of leguminous, and other herbage and forage plants, as of the grasses.

The following enumeration of such grasses as have partly failed, from the effects of continued cultivation since spring 1834, or been replaced by others, is arranged in the progressive order of duration.

Poa annua, With the exception of two or three months in winter, keeps up a constant succession of flowering, seeding, and vegetating; but on good soils becomes almost entirely replaced by stronger growing grasses, and other indigenous plants.

Agrostis Spica-venti.—Although only of annual duration, is, from being of taller growth, better able to contend with strong growing plants than the preceding, but being a native of a more southern climate, its seeds in this country do not arrive at that perfection necessary to render them generally capable of vegetating.

Agrostis rupestris, formerly noticed under the name of *A. setacea*, can scarcely be considered more than of biennial duration, having nearly died out the second year, and entirely so the third after sowing; and, like the last, does not perpetuate itself readily by seed, in consequence of these not ripening except in very favourable seasons.

Lolium perenne, Varieties termed Annual Ryegrass, Common Perennial, Molles, Pacey's, Stickneys, and Devon-overs, being all allowed to ripen without shaking their seeds each year, have gone off in the order named, so that at present the last does not occupy more than one-third of the surface which it originally covered, and the first variety had to be resown each spring, having usually about four-fifths perished.

Lolium Italicum possesses about the same permanency as the common Perennial Ryegrass under similar treatment, being inferior in this respect to the four varieties last named.

Elymus sibericus is fully as much displaced as the more permanent varieties of ryegrass, arising apparently from the soil not being sufficiently light and dry, as well as from the injurious effects of rust in the course of the two last seasons.

Avena flavescens.—Shortened in duration by the nature of the soil, as also partly from being overgrown by stronger plants; which remarks are equally applicable to the four following: *Anthoxanthum odoratum*, *Cynosurus cristatus*, *Aira flexuosa*, *Poa trivialis*.

Glyceria fluitans, both short and long seeded varieties are partly replaced by indigenous grasses, which is easily accounted for from their naturally growing in wetter soils, as well as their comparatively dwarf or prostrate habit, and the straggling inoffensive fibrous nature of the roots.

The preceding comprehend all that have, to any decided extent, been replaced. The following is a bare enumeration

256 *Mr Black on Grasses cultivated at Dalkeith Park.*

of those which have stood, so as at present to occupy the ground to the more complete exclusion of all indigenous sorts, arranged in the same order as before observed.

Aira caespitosa, var. *lutescens*, *Airhenatherum avenaceum*, *Festuca tenuifolia*, *F. ovina*, *F. duriuscula*, *F. lolacea*, *Bromus giganteus*, *Poa pratensis*, *Holcus lanatus*, *Festuca pratensis*, *F. elatior*, *F. heterophylla*, *Agrostis stolonifera*, *Alopecurus pratensis*, *Agrostis alba*, *A. Capillaris*, *A. dispar*, *Aira caespitosa*, *Poa nemoralis*, var. *nervosa*, *Poa nemoralis*, *Phleum pratense*, and *Dactylis glomerata*.

The following are the principal sorts recently added, and which have been in the garden at least one year.

Triticum caninum, Dog's couch-grass, sown spring 1836, flowered latter end of August, and partly ripened seeds in the same season, height fully two feet, produced a more than average bulky crop of broad but tender foliage, much relished by cattle, seems a more bulky crop than last year, but appears rather subject to be infected by rust.

Phalaris arundinacea, Reed Canary-grass, produced two crops same season it was sown, being about three feet in height at each cutting. Although to appearance this is a very rough coarse grass, yet it is greedily eaten by cattle, if cut before coming into flower, in which case it will yield, after the first season, three, or even four, extraordinary crops annually. It succeeds best in a deep moist soil, from which its strong and powerfully creeping roots render it difficult to eradicate when once established.

Poa nemoralis, var. *nervosa*, Hudson's Bay Hay Grass. This valuable acquisition, which was first brought into notice by Mr Thomas Bishop, Methven Castle, Perthshire, although noticed in the last report under the name of *Poa nervata*, was not sufficiently established to admit of its merits being pronounced. Succeeding trials, however, prove it deserving of the high encomiums recently bestowed upon it in various publications. It differs from *Poa nemoralis*, in flowering at an earlier period of the season, in growing more freely after being eaten or cut down, and in the finer and more lively green colour of its foliage. It succeeds equally well with the other under the shade of trees, and is altogether a most desirable variety, either as a hay or pasture grass, particularly in lawns and pleasure-grounds.

ON THE INTRODUCTION OF *PINUS UNCINATA* AND *P. PYRENAICA*. By Mr CHARLES LAWSON, the Society's Nursery and Seedsman.

ACCORDING to Loudon, Sweet, and other botanical writers, *P. uncinata* was first introduced into Britain in 1820, although it has been stated that a single specimen in the Glass Niven Botanic Garden near Dublin, is of much longer standing. Be this as it may, *P. uncinata* has hitherto been considered in Britain as one of the rarest exotic species, and only to be met with in a few of the more complete collections of the genus. *P. pyrenaica* is of still rarer occurrence in this country than the other, and we are not aware of its having been at all introduced previous to Captain Cooke's return from Spain, to whose highly interesting work, entitled "Sketches in Spain, during the years 1829-30-31, and 1832," published in 1834, we are indebted for remarks on these, and other trees indigenous to that portion of southern Europe, which had previously been overlooked, or very slightly noticed even by the botanists of their native country. In the xxiii. chap., entitled *Natural History* of Captain Cooke's work, the accounts given of these Pines, induced Sir John Naismyth, Bart, of Posso, to procure a quantity of seeds from the natural forests on the Pyrenees, and he has been successful in receiving two bags of cones, containing about half a peck of each species, in good preservation, and from which we calculate upon raising upwards of 1000 plants of each.

The following extracts from Captain Cooke's Sketches tend to shew the merits of the two species, and from the description given of the *P. uncinata*, it may yet form an important feature in the immense tracts of mountainous waste capable of producing it in its native perfection, above the altitude where the Scotch fir ceases to exist, and where even the larch,

notwithstanding its superior hardihood, is compelled to yield to the rigour of climate.

"The northern side of the high Pyrenees affords a complete example of successive zones, or lines of superposed vegetation, which can be traced along the flank of the higher range, by threading the mountains between Bagnères de Bigorre, and of Luchon, and the country east and west of these places in the ascending series, the vine, chestnut, and oak of various species are succeeded by the beech, the silver fir, and a few of *Pinus sylvestris*, or Scotch fir, and the highest and most inclement range up to the limits of congelation and the habitat of lichens and other Siberian plants, exclusively by the *Pinus uncinata*, the most interesting tree of these regions." * * * "In going to the lake of Gaube, where a scrap of native forest yet exists, owing to its having remained in possession of the Government; in it the three species of pine (*P. pectinata*, *P. sylvestris*, and *P. uncinata*), some of them of great antiquity, may be seen growing together, the *uncinata* gradually taking the higher place. The upper zone of this chain is formed entirely of the *P. uncinata*, which is a species hitherto almost unknown or unattended to, and which is certainly one of the most valuable trees in the European flora. The name is given in consequence of a peculiarly hooked form of the scales, which is extremely marked, especially just before maturity. This character has been disputed, but a very little practice and observation will enable any one to pronounce, without hesitation, on seeing the different colour and character of the tree from those of its congener, the *sylvestris*; the cone is rougher, and of a different and more rugged texture than that of the *sylvestris*, or any other I am acquainted with. An additional proof of the hardiness of the tree is afforded by the early ripening of the cones. I gathered some in the valley of Andorre in July, which were full formed, at a season when those of a southern climate are yet far behind in vegetation. The reason of this admirable arrangement is evident. In these elevated regions the season of vegetation is so short that the operations of fructification must be proportionably accelerated to insure their completion. The seed from these cones vegetated; and it is of great importance to be aware of this fact, because the collecting the seed of this species is difficult in many seasons from the early falling of the snow. The rule I followed was to select the cones when they had assumed a brown green, and cut dry to the knife; on opening them in this state the seeds will be found quite formed, and of the taste of a green almond when eaten. It is of the last importance that they should not be taken out of the cones until the planting season, and that they should be kept dry. I had a quantity spoiled by some wet moss, with other plants being imprudently packed with them in my absence. The port and bearing, as well as colour, are quite different

from that of any other species; the form, where the tree is fairly developed, is round and massy, frequently resembling that of some of the deciduous trees, the long arms sweeping the ground; the foliage is longer and much more tangled than that of the Scotch fir, and the green much more intense. It is so dark, that the Spanish woodmen distinguished it by the name of *Pino Negro*, the two varieties of the *sylvestris* being called *Blanco* and *Rozo*. The growth, as far as I could judge, appeared to be about the same, or of rather greater rapidity than that of the Scotch fir. The wood is highly resinous, so much so that it serves for torches, and it is reputed in the Pyrenees to be of very great duration. A peculiar quality, which, if it succeed in other respects, will make it invaluable in some parts of England, is that of resisting the wind, from some cause not explained, but which proceeds, in all probability, from the operations of nature in restoring the equilibrium of temperature between the Siberian regions of the high Pyrenees with that of the comparatively burning plains below. It may be connected probably also with the arrangement which has made the *Puertos*, or passes of this chain, the highest in Europe; they reach nine and even ten thousand feet, the highest peaks being a very little more elevated than the ridges which unite them. Whatever be the cause, the wind, in those upper regions, rages with a violence and constancy unknown elsewhere, even in the Alps, where the same phenomena might be supposed to exist. There are harrancos in the district of Maledatta, where, according to the figurative expression of the Spanish peasantry, it blows every day in the year. In these inclement regions, where I have observed the tree in every form and situation, I never saw an instance where the wind appeared to affect it, nor where it shewed a weather side. At the upper limits of its habitat, where it is compelled to yield to the law of nature, and lower its "diminished head," the same rule is observed, and instead of the stunted and starveling appearance of the rest of the tribe in similar situations, it assumes the shape of a furze bush, presenting an impenetrable and bristling front of dark spiculæ on every side, the stem or branches being quite undiscoverable. * * *

P. Pyrenaica of La Peyrouse grows at the foot of the chain immediately opposite the highest range, and at an elevation probably from two to four thousand feet. The foliage is of a light grass-green, quite unlike any other European species; the spiculæ are very long, and of free growth. The tree is of elegant and noble form, and more resembles those of southern climates than most of the European sorts. The cones are of a light reddish-green, and the seed is inclosed in a thin shell. The wood is not bad, but is of much inferior value to the other kinds which grow above it."

Pinus uncinata, Hook-fruited pine. *P. sanguinea* of La-perouse, *Pino Negro*, or Black Pine of the natives. Tree 40

to 50 feet in height, having, when freely exposed on all sides, a large roundish head, composed of long horizontal or decumbent branches. Terminal buds covered with transparent whitish resin; bark rough, and of dark brown colour; leaves in pairs, darker in colour, more rigid and densely set on the branchlets than those of the *Pinus sylvestris*. Cones shortly stalked, upright when young, afterwards horizontal, and ultimately pendant, little more than an inch long and of an ovate shape, having the scales on their upper sides much elongated and closely reflexed or hooked backward, and those on the under side considerably shorter; colour, when ripe, dusky-brown; seeds very similar to those of the Scotch fir.

This species has been confounded with the *Pinus Pumilio*, a few cones of which were picked in the bag of *P. uncinata* cones, which proves that that species is also to be found in the Pyrenees, but with the exception of locality the two are possessed of no other characteristics in common, the *P. pumilio* never attaining to more than the size of a large shrub, even when cultivated under the most favourable circumstances. Mr James Campbell younger of Succoth, who is well acquainted with the various habits of the *P. uncinata*, mentioned by Captain Cook, informs me that its chief locality is on the Spanish side of the Port de Venasque, at the foot of the Maladelta above the Bagnieres de Luchon, from which plants have been brought down to the gardens at Luchon, where they thrive well, and are now twenty years old.

P. pyrenaica.—Leaves in pairs, long, slender, and of a light grassy-green colour; cones about two inches in length by one in diameter near their base, from which they taper regularly to the point; foot-stalks short; scales regularly imbricated, possessing a marked uniformity in the shape of the exposed points, which are blunt or slightly elevated, and tipped with a small hard crust; colour, when ripe, light-brown, smooth, and shining; seed, about four-tenths of an inch long, or nearly half the length of their membranous light coloured wings, with a friable thin light-grey shell or skin.

The botanical description of these pines is very incomplete ; but that given will serve to distinguish the species, *P. uncinata* being easily known by its hooked cones ; and the cones, as well as much larger seeds of *P. pyrenaica*, rendering it essentially different from *P. Laricio*, or *P. austriaca*, the only European species to which it probably bears any resemblance.

ON RABIES IN SHEEP. *By Mr ADAM DICKSON, Surgeon,
Rachan Mill, Peeblesshire.*

THE dog, by the bites of which the hydrophobia* or rabies was communicated to sheep, was a cur, and had been observed, without exciting any suspicion, for some days before the 28th of April 1837. On that day, having been seen to kill a lamb and bite several sheep, it was pursued from Cardon in Holm's Water, to Crook, a distance of seven miles, and there destroyed. Feeling curious to know whether it would display the appearances which are usually supposed to mark the disease, I went and examined it next day.

The pharynx and salivary glands were in a perfectly sound and natural condition, as well as the gullet and stomach, the latter of which was quite empty. The windpipe, which is supposed to be the peculiar seat of the disease, exhibited only the very slightest degree of vascularity of its lining

* It is well known that hydrophobia, as a name for canine madness, is a misnomer, as the disease in the dog is not characterized by any dread of water as in the human subject : on the contrary, dogs affected with the disease are rather greedy after water, and lap it with avidity. The term madness, as descriptive of the disease, is equally improper, for, in the greater number of instances, there is no savage fury, but only an increased irritability of temper, which may not for some time excite notice. These two mistakes regarding the symptoms of the disease, have often conduced to fatal errors ; for it being the received opinion, that, whilst a dog is not furious, and can lap water, he is not mad, many persons have been lulled into dangerous security.

membrane, and principally in the interspaces between the cartilaginous rings. This vascularity existed more or less from the larynx or upper part of the windpipe,—into which, however, it did not extend,—down to the division into the bronchial tubes, where it was more apparent; but there was no undue quantity of secretion present, nor was it in any degree frothy. There were no other marks of disease.

These appearances were so equivocal, that they left considerable doubt regarding the actual presence of the distemper; but this may be accounted for from the period at which the animal was killed. From the dubious results of this examination, however, coupled with the subsequent occurrences in the sheep, an inference of some practical importance may be drawn, viz., that the disease may be communicated at a very early stage, and therefore that timely precautionary measures are proper in every suspected case.

On the 12th of May, a fortnight after they had been bitten, three of the sheep were reported to be affected with madness, and it was said that they were furious, and bit at every thing that came in their way. I saw them on the 15th, and as the symptoms of these three and of those which were seized at later periods were precisely similar, I may combine into one view the observations made at different times. I found that, with customary exaggeration, report had greatly overstepped the truth. They all appeared to be in a very feeble and debilitated condition, but manifested a pert boldness and familiarity, very unusual in hill sheep. They came up quite confidently to a person approaching them, instead of running away, but displayed no disposition to bite; nor did they shew the least fury in their manner. One of them, which was said to be specially addicted to biting, did attempt to nibble at any thing held out to it, but on inquiring, it was found to be half domesticated, and accustomed to eat bread from the hands of the children, and upon presenting it with a little grass, it took it quite quietly from my hand. As the others,

though not displaying their usual shyness, were not so familiar, and did not display even this degree of the biting propensity, being confined, I had them set at liberty among the other sheep, and watched their motions. They walked up to the others, poked their noses against their sides, and attempted, though their debility was obviously too great, to leap upon them with their fore-feet. When the sheep, teased with this annoyance, went away, they did not go after them, but turned to the others, behaving in the same manner, and continued going from sheep to sheep, in this way, until they were again caught and confined. The object of having them set at liberty was to ascertain whether they would make any attempts to bite, as it was apprehended they might spread the disease extensively through the flock. They distinctly made no such attempts, and their conduct towards the others, in all the cases observed, was precisely what has been described.

The shepherds reported that they had frequent convulsions;—these I did not see, but examination of the dead bodies rendered the statement highly probable. The first which was examined had not the characteristic appearances very distinctly marked. There was a considerable degree of inflammation in the windpipe, but it contained a number of thread-like worms, each about three inches in length, which might account for it. It was in a very emaciated condition, having been labouring under disease in the abdomen of some standing. It is known that, in debilitated animals, worms in the windpipe are not an unfrequent occurrence, and that they also give rise to convulsions. In the others, the marks of the disease were very decided. The nose, windpipe, and bronchial tubes, and even the mouth, were filled with a brownish coloured frothy mucus; and the membrane lining the windpipe was highly inflamed and vascular, and in some places as dark as wine-lees. These appearances, which are believed to be characteristic of the disease, were uniform in all the cases examined. The number of sheep ascertained to have been bitten

was thirteen, of which eleven died ; the remaining two shewed no symptoms. Only one of them was suckling a lamb ; it was one of those which died, but the lamb, though it continued to suck till the mother died, had suffered nothing in consequence.

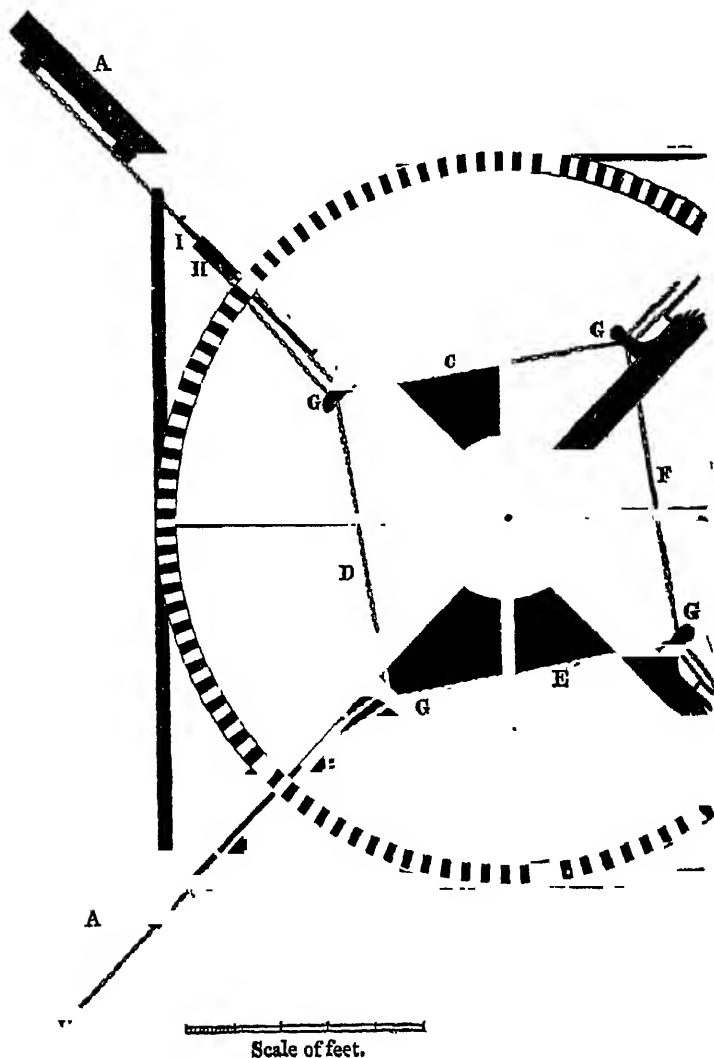
Thus far my own observations regarding the recent cases of rabies in this neighbourhood ; but as the question of propagation among a flock of sheep is of great importance, I may add that it has been denied that sheep *can* propagate the disease even though they were to bite. In a memoir read to the French Institute, M. Huzard maintained that herbivorous quadrupeds affected with rabies are incapable of transmitting the disease ; and this fact was subsequently confirmed by additional experiments and observations, made at the veterinary school at Alfort. Professor Dupuy could never succeed in communicating the distemper to cows and sheep, by rubbing their wounds with a sponge, which animals of the same class, already labouring under the same disease, had had in their mouths, though the same experiment, made with a sponge which had been bitten by a rabid dog, propagated the disease by inoculation. Dr Gillman inoculated two rabbits with the saliva of a rabid pig, but no effects followed. The only case alleged against the incompetency of herbivorous animals to propagate the disease, is one where it was stated to have been communicated to a fowl, by inoculation with the saliva of a rabid ox, but the case being accompanied by no details is not entitled to much credit.

IMPROVED METHOD OF EQUALIZING THE DRAUGHT OF
HORSES IN A HORSE-WHEEL OF THE COMMON CON-
STRUCTION. *By Mr CHRISTIE, Rhind, Fifeshire.*

THE method which Mr Christie has adopted of yoking horses to the horse-wheel of a thrashing-machine, and which has been followed by several of his neighbouring farmers, is

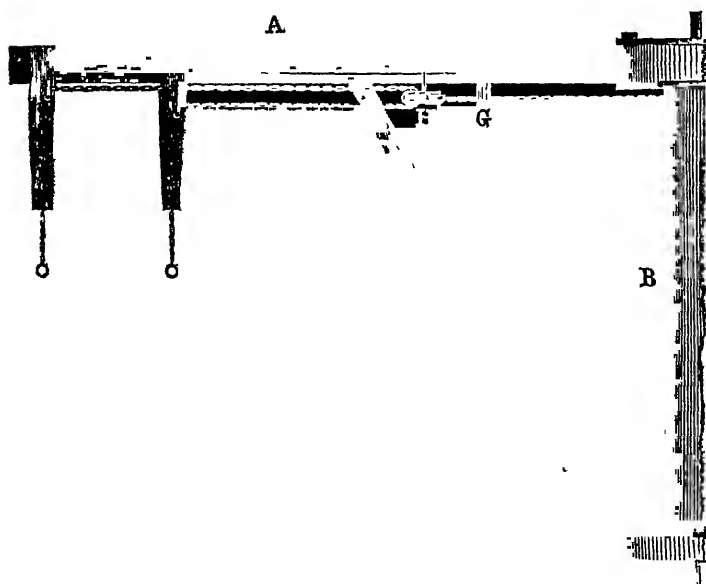
an improvement on that method which has been long in use, consisting of a ring-chain, to which the draft-chains are severally attached at proper distances. The cut No. 1. exhibits part of a horse-wheel, drawn from Mr Christie's model, mount-

No. 1.



ed for four horses, A A being two of the horse-beams, with the arms and framing of the same, and part of the toothed segments, CDEF is the ring-chain forming a square, being for four horses, with this peculiarity, that at each angle of the square, the chain is extended into a loop passing out between two pulleys set in the stationary blocks, G G. In the bend of these loops, a double movable pulley H, H, is placed, one of their sheaves receiving the loops of the ring-chain, while the other sheave receives the bend of the draught-chains, the pulleys being supported on the sliding-rods I, I. The two branches of each draught-chain pass over pulleys, until their extremities reach the point of attachment to the harness in the usual manner. Cut No. 2. is a geometrical elevation of the same wheel and apparatus, representing one horse-beam only, and the upright shaft B cut off at the centre; in this the same letters refer to the corresponding parts in No. 1.

No. 2.



Note by Mr Slight, Curator of the Society's Museum.—By the old method of the ring-chain, where the draft-chains were simply attached to it at regular distances, it became divided into a square, a hexagon, or an octagon, according to the number of horses. In that system, the horses pulled also against each other; the draft-chains being passed over pulleys, to bring them to the yoking point, but the forces they exerted were subject to the laws which govern a system of forces, arranged on the same principle as this ring-chain, and in mechanical philosophy, called *the Funicular System*. In the case under consideration, so long as the ring or main chain preserved a figure having equal angles, whether a square, a hexagon, or an octagon, just so long would all the horses have an equality of draught. But, if one horse, suppose a lazy one, slackened a little, some other one, or all of them, must of consequence start proportionally ahead. This would change the angles of the figure formed by the ring-chain, and by virtue of the law of oblique forces just alluded to, the lazy horse had power to resist any of the others, though the amount of actual force exerted by him might be considerably under any other individual horse.

Under certain circumstances, it is true, the apparent defect of that system might have its advantages, such as the case of one horse possessing more muscular force than another, such horse by being allowed to start a' head, would have an opportunity of expending that extra force in aid of his weaker yoke-fellows.

The immutability of the figure given in position to the ring-chain by Mr Christie's method, will be at once apparent, and from this property it follows, that though any horse either start ahead or slacken his pace, the only effect produced is to augment or diminish the extent of the loop by which he draws, and produce a contrary effect upon all the other loops. As these changes produce no alteration in the figure formed by the ring-chain, the force exerted at each angle remains equal

and the same as before, and this will hold in every case when the equality in the angles of the figure is preserved; but there is a consideration that may be worthy of notice. Every farmer has his stronger and weaker horses, and to apportion judiciously their labour to their strength ought to be always an object, more especially when they are employed in the thrashing-machine, which is allowed to be the most severe labour that a farm-horse can encounter. The principles of the new arrangement, being of a nature that brings its effects completely within range of calculation, or of geometrical definition, it is capable by very slight and simple modifications to accommodate every degree of strength of the horses employed, and that with comparative certainty and uniformity. These objects may be attained by having the pulleys G, G, fitted to move outward and inward in reference to the centre of the wheel at pleasure, and capable of being fixed at any point. For example, if one weak horse is to be employed, let the pulley G of the beam to which he is to be yoked, be moved a certain space *towards* the central shaft, and fixed there, and the force required of this horse will be lessened in a certain proportion to the space over which the pulley G was moved. Suppose, again, that in the same team there is a horse possessing strength superior to either of the other two horses, let the pulley of the beam, opposite to the weaker horse, be moved *outward* a certain space and fixed, the strong horse being yoked to this, his draught would be increased in like proportion, and thus, by a very simple change of position of these pulleys, and consequent change of form in the position of the ring-chain, the resistance to each horse may be duly proportioned to his strength.

TRIGONOMETRICAL SURVEY OF SCOTLAND.

THE Directors of the Highland and Agricultural Society, considering that it would be of great importance to all classes of the community, and especially to the owners and occupiers of land, to have a correct measurement made, and accurate maps published, of Scotland, came to the resolution of memorializing Government on the subject.

It has been thought right to give a short account of the steps which were taken by the Directors, and the communications they held with Government, regarding the Scottish survey, in order that the public may see the objects intended and expected to be attained by it. Whether the objects proposed by the Directors in their last memorial, are all that require to be embraced in the survey and the maps, may form a question. But no one, after reading the statements contained in the first memorial, can entertain a doubt, as to the necessity of a survey, to correct the errors and supply the deficiencies of the existing maps. If the new maps are constructed in such a way and on such a scale, as to afford all the information that has been suggested by the Directors, the boon to the country will be great indeed. Whether or not Government will adopt the suggestion of the Highland and Agricultural Society, as to the objects to be represented on the maps, still remains matter of uncertainty; and, in fact, it was the fear of alarming Government with the magnitude of the undertaking, which prevented the Directors from asking more than they ventured to do, in the last memorial submitted by them,

“ To the Right Honourable the Lords Commissioners of His Majesty’s Treasury, the Memorial of the Directors of the Highland and Agricultural Society of Scotland,

“ Sheweth,—That your memorialists have resolved, but

with the utmost respect and deference, to bring under your Lordships' consideration, a subject of great importance to Scotland, and in which (as they humbly think) the aid of Government would be eminently serviceable. It is an undoubted and lamentable fact, that no map exists, which represents with correctness, or on any scale that is practically useful, the physical and political geography of this part of the United Kingdom.

"The only maps of Scotland are those by Ainslie and by Arrowsmith; but they are both constructed on such a scale (viz. one-fourth of an inch to a mile), that not more than a fourth or a fifth of the places and objects which ought to be represented, are found in them; and when it is added, that the former of these maps was published so far back as forty-eight and the latter thirty-six years ago, your Lordships will at once perceive, that, from the great changes that have since taken place in Scotland, those maps, even though they had correctly represented the geography of the country as it then existed, must be in a great measure inapplicable to the country in its present condition.

"It is true that in 1825 a new edition of Ainslie's map of Scotland was published, professing to contain some amendments; but these were so trivial and unimportant, that the character of the map was only very slightly improved, and Arrowsmith's map, published so far back as 1801, still retained, and yet possesses, the reputation of being the best map of Scotland in existence.

"But this map, as your memorialists have already observed, has, on account of the great and numerous changes that have taken place in the physical and political condition of Scotland, during the last thirty-six years, become nearly entirely useless. It is applicable to a state of things which has almost entirely ceased to exist; and with regard to the objects and things delineated on it which still exist, it is so defective, or inaccurate that it cannot be safely relied on.

“ Your memorialists would not have ventured to submit these statements to your Lordships, had they not been convinced of their being well founded; and it is a subject on which, as Directors of the Highland and Agricultural Society of Scotland, they may perhaps be permitted to offer some opinion,—for they beg to inform your Lordships, that one of the objects to which that Society has directed its attention, is to obtain geological surveys of different districts of the country;—and those who carry on such surveys are particularly required, to point out any errors or omissions they may detect in the existing maps. It is almost unnecessary to add, that the result of these geological surveys has been to prove the extreme inaccuracy, not merely of Arrowsmith’s map, but also of the maps that have been separately constructed, on a larger scale, of some of the Scotch counties.

“ But the memorialists do not require to adduce their own testimony on this subject. They might have contented themselves with referring to a document of an official character already in your Lordships’ hands, for a full exposition of the defective state of geographical information regarding Scotland. The memorialists allude to a report presented to your Lordships within these last eighteen months, by the late Dr MacCulloch, explanatory of the Geological Survey of Scotland, which he was employed to make at the expense of Government. Your Lordships will see from this report, the extreme difficulty which Dr MacCulloch had to contend with, owing to the non-existence of any map that could be trusted to. He stated to your Lordships, that, notwithstanding the antiquity of Arrowsmith’s map, and the smallness of its scale, he had found it necessary to make use of it, as the best that existed. But it will also be seen from his report how extremely inaccurate, he, in the course of his examination of the country, found that map to be. He mentions that in innumerable instances, he had found populous villages, parish churches, rivers, lochs, and even mountains (including Ben Nevis itself) either omit-

ted or misplaced ; and that whilst the important islands of Barra and Rona, and the rock of Ailsa, were marked down in a wrong situation, the Island of St Kilda was altogether omitted. With regard to one large county represented on Arrow-smith's map, Dr MacCulloch observes, that ' for *aught of resemblance* between the country and its pretended map, whether under physical or political geography, there are *many parts* of it, which might as well pass for *daughters of Africa*, as of *Scotland*.'

" If such was the character of the map, which Dr MacCulloch had to guide him in his survey of Scotland, and on which he was obliged to delineate its geological structure, it is perhaps not surprising, that so much both of time and of money should have been spent in completing this survey, and that after all, the survey should be extremely defective and unsatisfactory. Till correct geographical maps are constructed, it is impossible to construct geological maps having the slightest pretensions to accuracy and usefulness.

" Your memorialists do not deem it necessary to add a single remark, on the disadvantages which must arise, from the want of any correct map of Scotland, constructed on an enlarged and uniform scale. From what has just been said, it is evident, that the objects, whatever they were, for which Government directed a Geological Survey of Scotland by Dr MacCulloch,—must have been, notwithstanding the very large sums expended on it, in a great measure frustrated ; and your memorialists, in endeavouring to carry into execution some important objects of their Institution, have themselves laboured under similar disadvantages. But, in addition to the benefits that would accrue to *science* by the construction of such a map, your Lordships must at once perceive, that it would also be most serviceable to the public generally, and more especially to those classes who are connected with the navigation, the agriculture, and the commerce of the country.

“ It is with the utmost satisfaction that your memorialists view the progress of the Ordnance Surveys which are now carried on simultaneously in England and in Ireland. No person can entertain a doubt as to the propriety and expediency of such surveys being directed by Government, and entrusted to engineers selected by Government, for assisting in an undertaking of such importance as well as of such magnitude and difficulty. Your memorialists would therefore humbly, but earnestly, entreat your Lordships to direct, that a similar survey should be immediately commenced in Scotland, so that, in the course of time, the evils which have been alluded to, arising from the want of correct maps, may be removed and remedied.

“ Your memorialists would the more earnestly press on your Lordships, the propriety of ordering a survey to be commenced in Scotland (and on the same plan which has been so usefully followed in Ireland), on account of the circumstance, that the triangulation of a considerable part of Scotland has been already obtained by Government surveyors. About ten years ago, as your memorialists are informed, this Government survey, after having been carried on for several years, was suddenly stopped, and all the persons who were engaged in carrying on the survey were suddenly recalled, though for what good reason, your memorialists have never been able to discover. If ever the Scottish survey is to be resumed under the direction of Government, it would evidently be desirable to resume it before the marks on the hills, and other objects which formed points in the triangulation, have become obliterated and defaced, and before all the circumstances connected with the survey have been forgotten.

“ By order of the Directors,

(Signed) “CHARLES GORDON, *Secretary.*

SOCIETY'S HALL, ALBYN PLACE,
EDINBURGH, 31st May 1837.”

Excerpt from Letter the Duke of Sutherland to Sir Charles Gordon.

“STAFFORD HOUSE, June 3. 1837.

“I have to acknowledge the receipt by this post of your letter of 31st ult., and also of the memorial of the Directors of the Highland and Agricultural Society to the Treasury on the subject of the Ordnance Survey of Scotland, which I transmitted immediately to the Chancellor of Exchequer. I should acquaint you, that on hearing from Mr Robison that Sir Thomas Brisbane and he were to have an interview with Mr Spring Rice, I, in anticipation of the memorial which I had been informed it was the intention of our Society to send, took the opportunity of accompanying them. Sir Thomas Brisbane urged the subject, and we left the Chancellor of the Exchequer with the hope that the representation will have good effect. I have also taken an opportunity of mentioning it to Lord Melbourne, and you may be assured of my desire to assist in advancing so desirable and important a measure.”

“TREASURY CHAMBERS, 16th June 1837.

“GENTLEMEN,—Having laid before the Lords Commissioners of his Majesty’s Treasury your memorial of 31st ult. requesting that the Survey of Scotland commenced by the Ordnance may be completed, I have it in command to acquaint you, that my Lords having communicated with the Master-General of the Ordnance thereupon, and having ascertained that it will not be expedient to commence that work at this period of the year, they have authorized the Master-General to give directions for the recommencement of the great triangulation in 1838, and also for taking such steps at present as may ensure the prosecution of the work at the earliest possible period of the ensuing year. I have the honour to be, &c.

A. B. SPURMAN.

To the Directors of the Highland and
Agricultural Society of Scotland.”

The steps which had been taken by the Directors, and the above documents, were communicated to the General Meeting of the Highland and Agricultural Society, which was held on the 3d July 1837. The meeting came to a resolution, as its minutes bear, “highly approving of the steps taken by the Directors in this important business, and were much gratified with the prompt attention given by Government to the Society’s representations: And they remitted the whole matter connected with the Trigonometrical Survey of Scotland to the Directors, with instructions to consider it in all its bearings, and submit their views to Government, as to the scale and other circumstances, tending to render the Survey most useful and serviceable to the public.”

In consequence of this remit to them, the Directors drew up the following memorial to the Lords of the Treasury, and which was forwarded to be presented by his Grace the Duke of Sutherland.

“Unto the Right Honourable the Lords Commissioners of Her Majesty’s Treasury, the Memorial of the Directors of the Highland and Agricultural Society of Scotland.

“Your memorialists would again request your Lordships’ attention to a subject on which they took the liberty of addressing you a few weeks ago, namely, *the Trigonometrical Survey of Scotland*. The object of the Memorialists’ previous application was, to make known to your Lordships the defective state of geographical knowledge in regard to this part of the United Kingdom;—to point out the disadvantages arising from the want of correct and proper maps,—and to express a hope, that your Lordships would direct the Trigonometrical Survey of Scotland to be resumed, under the Superintendence of the Board of Ordnance.

“This application, your memorialists are informed, by Mr Spearman’s letter of the 16th June, that your Lordships

had taken into consideration ; and that, after communicating with the Master-General of the Ordnance, you found it would not be possible to recommence the Survey this year, but had given orders that it should be proceeded with as early as possible in 1838.

“ Your Memorialists, deeply sensible of the boon thus promised to the country, as well as of the honour conferred on them by the prompt attention shewn to their application, deemed it proper, at the half-yearly general meeting of their Society, held on the 3d instant, specially to notice the communication the memorialists had held with your Lordships on this important subject, and to afford to the members of the Society an opportunity of expressing their sentiments in regard to it. The meeting were unanimous in their expression of thanks to your Lordships for the resolution you had come to, as well as for the attention paid to the memorial of their directors ; and they instructed your memorialists to tender their thanks to your Lordships in the name of the Highland and Agricultural Society.

“ But, whilst performing the duty thus specially devolved on them, your memorialists would also avail themselves of this opportunity of making known to your Lordships the satisfaction which has been felt by all classes on the announcement that the Trigonometrical Survey of Scotland is to be resumed. In explanation of this general feeling, it is hardly necessary again to refer either, on the *one* hand, to the inconveniences and injury arising from erroneous maps of our coasts and islands ; or, on the *other*, to the additional means of improving the inland communication of the country that will be afforded by maps, constructed with accuracy and on an enlarged scale. Besides the benefits which will thus be conferred on trade and commerce, the advantages to science cannot fail to be highly appreciated. The Geological Survey of Scotland, which some years ago was made by orders of Government, remains confessedly subject to errors,

which a correct geographical map alone can remove ; and geologists already anticipate their acquiring a far more intimate knowledge of the interior structure of this part of the globe, than at present they can attain, whenever the heights and relative positions of its mountain-chains shall be correctly determined. To astronomers also, a Trigonometrical Survey of Scotland, if executed with the same precision as in England and Ireland, will be a source of extreme interest ; as, by the mensuration of the meridional degrees, and the determination of the specific gravity of the mountains in this country, important additional data will be afforded, for ascertaining the density as well as the figure of the earth. And, independently of all these reasons for the survey, there will be removed the national stigma, that,—whilst in France, Bavaria, Austria, Sweden, Germany, Savoy, and Piedmont, and even in the far distant countries of India and of Peru, accurate surveys and maps, on enlarged and magnificent scales, have either been made or are being made by their respective governments,—there should actually be a large portion of Great Britain, the geography of which is but imperfectly known, and of which no maps exist that can be relied on.

“ These are some of the reasons which have created a general and lively feeling of satisfaction among all classes of society at the prospect of a Government Survey of Scotland ; and the Highland and Agricultural Society, with the view of making known to your Lordships some of the useful purposes which such a measure, if rightly conducted, may tend to promote,—at their last general meeting, specially instructed their Directors to offer to your Lordships, such suggestions as should appear to them calculated to render alike advantageous to the public and creditable to the country, the great work which your Lordships have ordered to be undertaken.

“ In submitting to your Lordships, conformably with these instructions, the views which have occurred to the memorialists, in regard to the intended survey, it is not their inten-

tion to offer any remarks as to the way in which the *triangulation* and *mensuration* of the country should be conducted. They feel confident, from the skilful manner in which the English and Irish Surveys have been carried on, under the superintendence of the Board of Ordnance, that, in these respects, nothing will be left undone that for any purpose could be desired.

“ The department of the survey on which alone they would venture to offer any suggestions, is that connected with the filling up of the maps, which will be constructed after the triangulation is completed. They feel assured, that every information which may be afforded by these maps, will, so far as it goes, be perfectly accurate. But they will be more or less valuable, in proportion as they convey more or less information ; and, of course, in order to increase the kind and quantity of information they are to contain, it will be necessary to enlarge, in a corresponding degree, the *scale* on which the maps shall be constructed.

“ Your memorialists have been informed, that the maps of the English counties constructed on the Government survey, are on a scale of one inch to a mile, and that the maps of the Irish survey are on a scale of six inches to the mile. It is probable that these different scales were fixed on with reference to certain particular objects which the English and Irish surveys were intended respectively to subserve. The memorialists would, on the same principle, beg to *specify the objects* to which the Scotch Ordnance maps ought, in their humble opinion, to be made subservient ; and, having done this, they would then leave it to others more competent than themselves, to determine what is the *scale* on which for these purposes the Scotch maps should be constructed.

“ In the *first* place, the maps ought, and it is presumed will, certainly represent, in a distinct manner, *the physical features and configuration of the country*, in respect of its mountains, valleys, and plains,—its rivers, lakes, &c., as well

as the outward signs of its inhabited condition, in regard to towns, villages, churches, and other prominent buildings, roads, canals, and harbours, &c.

“ In the *second* place, your memorialists would suggest, that the *heights above the sea* of all the mountains, whether isolated or in ranges, should be marked on the maps; and that, along the river courses and water-shed lines, the levels above the sea every quarter of a mile should also be marked. The importance of such information, as shewing whether and how districts of country can be drained, and whether and where canals and railroads can be executed, is sufficiently obvious.

“ In the *third* place, your memorialists would wish the *boundaries* of counties, parishes, and towns, to be delineated. Questions frequently arise in the Scotch civil, criminal, and ecclesiastical courts, where it is necessary to adduce proof of these several limits; and it would be highly desirable to have maps which were at once so authentic and authoritative, as to supersede any other evidence on these points. Little or no difficulty will exist in the ascertainment of these boundaries;—those of the Royal and Parliamentary Burghs having been already fixed and laid down on separate maps, by Commissioners who were appointed by the Crown for that special purpose.

“ In the *fourth* place, your memorialists would suggest that, amongst with the maps exhibiting the surface of the country, there should be sections of it from sea to sea, shewing at one view both its *geological* structure, and an outline of its *levels*. It is understood that, in surveying a country like Scotland, it is necessary, for the correct triangulation of it, to ascertain the deflection of the plummet from the perpendicular, in consequence of the attraction of contiguous mountains. For this purpose, an examination of the strata composing the interior parts of these mountains is required, so that it will be only putting the information thence derived into a particular form, in order to execute the ~~sections now~~ suggested. Dr MacCulloch's geological map ~~applies merely~~

to the surface of the country ; but it is understood that a great mass of information was procured by him (likewise under the authority of Government), as to the solid contents and specific density of the mountains in Scotland, and which information was communicated by him to the Board of Ordnance, to assist in carrying on the Scottish survey whenever it should be resumed.

“ In reference to the particular object now specified, your memorialists may add, that the Society of which they are Directors, have lately procured reports and maps illustrative of the geology of a good many districts in Scotland, several of which contain sections of the country exhibiting its internal structure. These documents, with any other information or assistance in their power, your memorialists have no doubt they would be authorized by the Highland and Agricultural Society to afford to the officers of the Government survey.

“ These are all the suggestions which your memorialists presume at present to offer to your Lordships, in reference to the execution of the survey, and the objects which it may be usefully employed to serve. They offer them with the utmost deference and respect, knowing well, that those who will be consulted as to the plan and details of this truly national work, will be persons who, on account of their experience, talents, and zeal for the public service, are in every way qualified to advise what will be most advantageous to the country. Your memorialists are ready, therefore, to confide in the wisdom and justice of your Lordships’ determination, as to all that concerns the Trigonometrical Survey of Scotland ; and they have only to repeat their gratitude, which is shared in by every member of the Highland and Agricultural Society, for the ready and liberal manner in which your Lordships have acceded to their application.

“ By order of the Directors,

(Signed) “ CHARLES GORDON, *Secretary*.

‘ SOCIETY’S HALL, EDINBURGH,

21st July 1837.”

DOWNING STREET, July 31. 1837.

MY LORD DUKE,—I have the honour to acknowledge the receipt of the Memorial from the Highland and Agricultural Society, and to assure you that the suggestions it contains shall be carefully considered. I have the honour to remain, with great respect, your Grace's faithful and obedient servant,

MELBOURNE.

HIS GRACE the DUKE of SUTHERLAND, &c. &c.

No official communication has as yet been made to the Directors of the Highland and Agricultural Society, from which they can say, whether Government will adopt all or any of the recommendations which it was thought proper to make in the foregoing memorial. It has been surmised, that the Chancellor of the Exchequer proposes to have the maps constructed on the scale of one inch to a mile, in which case they will be thirty-six times smaller than the Irish maps, which are on a scale of six inches to a mile. It is to be feared that, if the Scotch maps are constructed on this reduced scale, it may be difficult to represent on them all the objects contemplated in the memorial of the Directors, without at least crowding the maps in such a way as to render them indistinct;—a complaint that has been made against the maps under the English survey, which are also on the scale of one inch to a mile. It is believed that the only advantage looked for, as arising from this reduced scale, is the greater cheapness of the survey. But there is some doubt as to the realization of this result. A great number of persons necessary for the Scottish survey may now be draughted from Ireland, where their labours are drawing to a close; and as they have all their instruments and tables adapted to a scale of six inches, it would be attended with more convenience to them to adhere to the standard with which they are familiar. But if there is to be an abandonment of the Irish scale, as being greater than is necessary

for the objects of the Scottish survey, it is to be hoped that the scale will not be reduced so low as that adopted in England, the inconveniences of which are sensibly felt on an inspection of the Ordnance maps, and are acknowledged even by those who have been engaged in the survey.

ON THE MANAGEMENT OF PASTURE, IN REGARD TO THE
DESTRUCTION OF MUSCLES. *By Mr THOMAS BISHOP,*
Methven Castle, Perthshire.

[Five Sovereigns.]

THE lands, from which a part is selected as the subject of the following observations, are contained within the enclosures or house-farm at Methven Castle, in the county of Perth, belonging to Robert Smythe, Esq. They are from two to three hundred feet above the level of the sea. The soil, in general, is a heavy red loam, mixed with stones of various sizes, recumbent on a tilly subsoil, inducing a degree of damp approaching to wetness. They have, since 1812, undergone a great extent of drainage, first under the direction of the late Mr Stephens, in the Elkington mode of deep cutting and tapping for under-water; and latterly, with drains only from two to three feet in depth, in some cases cut transversely to the acclivity of the ground, and in others in the direction of the ridges, as circumstances suggested to be most effective and least expensive in taking advantage of those drains that had been previously made.

Yearly since 1825, one enclosure has been sown down with a mixture of grass seeds of those kinds best suited to the soil, and which have never failed to improve the pasturage greatly; although, in some instances, the seeds of two other species only were added to the usual quantity of rye-grass seeds, taking care to smoothen the surface particularly well before the seeds were sown, which always followed a green crop that

had been properly cleaned and manured, and the ground ploughed without open furrows.

The three fields that have been selected for a specimen of treatment, contain, on an average, between sixteen and seventeen acres each, lying contiguous to each other, and having a southern exposure. The first of rather light land than otherwise, required little draining, and was sown out with grass seeds with the grain crop of 1828, after a crop of turnips manured with a mixture of farm-yard dung, moss, the rubbish of old houses, and a portion of shell-marl, all carefully blended together to insure a regular fermentation. The quantity of grass seeds sown per acre, was 2 bushels of best perennial rye-grass, 1 peck of *Festuca duriuscula*, 1 peck of *Holcus lanatus* and *Agrostis vulgaris*, the two last being mixed as taken from hay seeds, and 5 lb. of white and 3 lb. of red clover, which altogether cost 21s. 8d. per acre.

The second field is composed of a rich heavy loam, naturally very damp, and which required a considerable drainage, before being limed and dunged for the green crops of 1829, and which was sown out with the barley and oat crops of 1830, with 1½ bushel of perennial rye-grass, 4½ lb. of *Phleum pratense*, 1 peck of *Festuca duriuscula*, 1 peck of *Alopecurus pratensis*, and 5 lb. of white and 4 lb. of red clover seeds, at an expense of 25s. 4d. per acre. These have hitherto given a very rich and luxuriant pasturage.

The third field is less of a good loam than the preceding, one-half of it being a hard retentive till, and of greater acclivity. This was also drained in the damp portions, previous to a deep ploughing given in the autumn before making the green crop of 1830; but no lime was applied until after an early crop of hay in 1832. It was sown down with the grain crops of 1831, with 2 bushels of Pacey's and Stickney's rye-grass seeds mixed per acre, 1 peck of mixed varieties of *Festuca duriuscula*, 1 peck of *Dactylis glomerata*, ¼ peck of *Poa trivialis*, 4½ lb. of *Phleum pratense*, and 5 lb. white and

3 lb. of red clover seeds, costing in whole 28s. 5d. per acre. All these fields had an early crop of hay taken from them the first season, and the after-grass of the same year, pastured off with calves or sheep in their stead, when it was not required for young stock. No top-dressing has been given to the first two fields since they were sown down, farther than spreading the droppings of the cattle left on the surface towards the end of each year, and cutting down or picking out all injurious root-weeds. But, on the removal of the hay-crop from the third field, a full dressing of lime was applied over the hay-stubble of 200 bushels per acre, and during the slaking of the lime shells, a large quantity of moss-earth which had been taken from the pit nine months before was decomposed with lime, and the compound spread on the worst part of the field.

This top-dressing of lime evidently encouraged a superior pasturage of white clover with other grasses, to that which the same quantity effected on either of the two other fields, when applied previous to sowing the green crops.

The stock grazed on the above fields, have been cattle during the summer months, and a light stocking of sheep through winter. They have been let to a respectable grazier for the last three years, on the understanding which he was ready to adopt, of shifting the stock from one field into another at proper intervals, and as frequently as possible, having one field empty, to allow a fresh spring of grass before the stock was again returned upon it. This mode of grazing has been found so very beneficial, that instead of different parties, who keep cows in the village of Methven, taking each separate grass fields, they have all united and taken all the fields conjunctly, in order to gain the advantages arising from the shifting of stock, and having a regular supply of fresh pasturage for their milch cows throughout the season.

Although particular circumstances required the taking of a hay-crop from the three fields, it is not the system wished to be recommended, when the land has undergone proper

drainage, nor is it here practised in general, preferring to have the first year's grass pastured with sheep; and until the land has been fully consolidated to carry heavier bestial, since the subsoil plough has been used, this plan has become absolutely necessary to ensure the beneficial effects which that operation is calculated to produce.

The growth of musci will always be found rapidly to take place when rye-grasses are the only grass seeds sown (excepting on the very best land), as it is not the nature of that kind of grass to form a close sward. The production of them is also much encouraged in older pastures, by eating the grass too bare in August, and the early part of September, as also by taking a crop of meadow-hay where the ground is not much trodden upon, or has been under water in irrigation or otherwise.

With a view to destroy musci and invigorate the better grasses, top-dressings have been used and found very expensive, and their effects as evanescent. Experiments have been made here for that purpose with bone-dust, put on in spring at twenty bushels per acre, price 2s. 6d. per bushel. Lime and soot to the same amount of cost. Common salt was also tried at a fifth part of less expense, and found very efficient, although fears were entertained, for a time, that the grass would suffer. The soot, in the following season, gave evident indications of its tendency to extirpate the musci, but not so powerfully as the salt; the lime and bone-dust used, had little or no effect. Liquid manure collected in a tank, under cover, from the feeding and cow byres, and washings of the dung-yard, have also been used, but not for the length of time to warrant a decisive opinion of its tendency to destroy musci, although their beneficial effects on grass land is unquestionable.

The last and most efficient remedy for the prevention and destruction of musci, and easiest to have recourse to, when the ground has not become altogether exhausted, or in an over

damp state, is to allow a great portion of the summer's grass to remain unconsumed on the ground, until the following winter, when the barer it is eaten before the new growth of spring, the finer will be the following summer's grass. But should the repetition of this treatment fail to extirpate the musci, it will be more profitable to put the grass lands under a rotation of crops, and sow them out anew with a mixture of grass seeds suited to the soil and climate. A little more manure than would have sufficed for a top-dressing, will thus be repaid with a richer and much more enduring herbage.

ON THE DESTRUCTION OF MOORBAND PAN. *By Mr*
RODERICK GRAY, Peterhead.

[Silver Medal]

MANY practical farmers are sufficiently aware of the existence of moorband *pan* in their lands, and of the importance of removing it by means of trenching, either by the spade or by the trench or subsoil plough. But others are opposed to the bringing up to the surface the cold ferruginous matter which separates the soil from the subsoil; because, as they allege, more manure is then required to fertilize the additional thickness of soil, for at least some years. There are those who neglect the subsoil and its importance to cultivation; whilst there is another class, the crofters, who are not possessed of the means for removing this impediment to the success of their operations.

The formation of moorband pan may be owing to various causes. 1st, To the subsidence of the metallic particles in the soil by their own gravity; 2d, To iron held in solution in the water passing slowly over the surface, or acquired from the decomposition of the rocks over which the rain water passes. The last supposition appears probable from the circumstance that the moorish soil on the top is generally composed of small particles of gravel intermixed with moss.

Having had considerable experience of the very beneficial results arising from the destruction of moorband pan, I can with great confidence recommend that, in every instance, where it is practicable it should be destroyed, or mixed with the arable soil—and this may be accomplished by trenching with the spade, or with the trench or subsoil plough.

OBSERVATIONS ON RECENT PLANTATIONS. *By ALEXANDER THOMSON, Esq. of Banchory.*

[Gold Medal.]

I have carried on for the last eighteen years a tolerably regular system of planting to a small extent each year, having planted in all during that time about 1,200,000 trees.

The plantations to which these observations refer are, with one exception, in the county of Kincardine, on the south side of the river Dee, and not far from its mouth, being from three to four miles distant from Aberdeen and from one to two miles from the sea; and the highest point planted is about 350 feet above its level. The situation is by no means favourable to the growth of wood; the soil is poor, and the plants are exposed to the injurious influence of sea air, the district being, in fact, proverbially bleak and barren.

On the lower part of the estate, lying near the river Dee, there are plantations of various kinds and ages, where the trees are as thriving as can be desired, especially the ash and elm, but none of these come within the period of this report.

I was anxious first to complete the plantations near the house and river, and then to carry my operations to the higher and more exposed portions of the estate; and to these latter this report is confined. They form part of that tract of land which I am improving by the settlement of crofters, and for a report on which I had the honour of receiving a premium from the Society in 1834.

The objects in view in doing so were three,—to obtain beauty, shelter, and possibly, in the course of time, useful timber; and in fixing the situations of the various plantations, the first consideration was to place them properly for sheltering the adjoining ground, and next to occupy with them as little ground as possible which was fit for cultivation, and, at the same time, to plant every spot which was not capable of improvement at a reasonable expense; and the principal objection to such a plan, is the great extent of fences which are required in proportion to the ground planted.

The fence I commonly employ is what is termed a sunk-fence, composed of turf alone, or of turf and stone mixed, three and a half feet high above the ground, a narrow scarcement, and then a ditch of at least one foot in depth. This forms a sufficient fence from the outset, and is easily kept in repair, while the tenants of the adjoining land are bound to lay down stones to face the fences as their improvements proceed—being at once both the fences of their fields and of my plantations. These fences are now executed at 1½d. per ell of thirty-seven inches, and the facing of stones, when built, costs from 3d. to 4d. In many instances, however, the stones taken out in the course of improvement would build six fences instead of one, and then they are merely cased up in front of the wood fence, to which they form the most effectual protection.

Next to fencing, the most necessary operation is surface-draining, without which, when it is required, fencing and planting are in vain. The dimensions of these drains vary according to circumstances; but it is an economical plan to make them rather deeper than necessary at first, in order to save cleaning out for several years. When two feet wide at top, one foot at bottom, and eighteen inches deep, they are executed at one penny per ell, and larger or smaller in proportion. The ditch along the face of the outer fence generally serves to drain the edges of the plantation.

With regard to the age of trees to be planted, my experience, in exposed situations, is most decidedly in favour of getting them "into their final stations at as early an age as possible." No universal rule, however, ought to be laid down; for, when the ground is covered by tall heath or strong grasses, small trees are choked and die, and larger plants must be used. The use of small trees is by far the most economical; they cost less from the nurseryman, are put into the ground much cheaper, and, in my experience at least, they thrive best. I had a striking instance of this in 1834, when, before our planting was completed, my nurseryman was sold out of two-year-old seedling larch, and I took 14,000 transplanted larch to finish the work; they were beautiful looking plants, and carefully planted, yet a large proportion of them died, while hardly one of the adjoining seedlings failed. Of late years seedling forest-trees have been so good and cheap, that I cannot raise them so cheaply as I can purchase them. For several years I have paid in Aberdeen for two-years' seedling larch from a shilling to eighteenpence per thousand, and tenpence to one shilling for Scotch firs. Last season (1836), however, the larch cost two shillings and sixpence per thousand.

The plantations on which I report are composed almost entirely of Scotch fir and larch, but in different proportions, as the soil and situation were supposed to be best adapted to the one or the other, varying from equal numbers of each to one-fourth Scotch fir and three-fourths larch.

The number planted per acre varies according to the situation; the more exposed and the poorer the soil the thicker we plant, with a view to the trees sooner affording shelter to each other; and accordingly, in very exposed situations, planted in the two last years, we put in above 5000 to the acre, being two and a half to three feet from plant to plant; but, in ordinary situations, from 3000 to 4000 per acre is quite enough, being from three and a half to four feet from plant to plant.

We use either the planting-iron or a well-worn spade in putting in the trees. The planting-iron is found to be very fatiguing in rocky ground, from the violent shock given to the arm when it strikes against a stone; but I rather prefer it to the spade, as making a smaller slit, and therefore less liable to open in dry weather. It is, however, fit only for seedling-trees. With the iron the work is more quickly done than with the spade. A labourer will soon learn to use it, so as to plant 200 an hour; and my forester assures me he can plant above 2000 in the short day of seven hours, in ground tolerably free of stones.

It is difficult to give any correct account of the proportion of deaths among the young trees. I find the greatest enemy to them is early drought the spring after they are planted. Dry weather opens the slits, and the roots not having fixed themselves in the adjoining soil, are quickly parched, and the tree is killed. I observe that more of the Scotch fir perish in this way than of the larch; whence I infer that the larch roots begin to grow sooner after the tree is planted than those of the fir. This is one of my reasons for preferring the *iron* to the spade. At the same time, I find that, at the rate per acre which we plant, little filling up is necessary; and I also find that, in attempting to fill up for one or two years after planting, we are apt to put in trees where they are not required. My general plan of filling up is to wait until the trees are so far advanced as to afford a little shelter, and then either fill up with the same sorts, or plant such hard-wood trees as are considered suitable, especially along the fences and surface-drains.

Beech and oak are the only two kinds of hard-wood trees which I have any hope of raising on my most exposed grounds, particularly the former. These I purchase seedlings, and nurse for one, two, or more years, according to circumstances. This is an economical plan, as the prices rise rapidly in the nurserymen's lists for each year of transplanta-

tion; but it has a still greater advantage, by enabling us to take up each morning the plants required for the day. The number so planted varies, according as it is proposed that these, or the larches and firs originally planted, shall be the principal crop. When suitable spaces are not found, a larch or a fir is taken out to make room for them. None of the plantations on which I now report have yet been filled up in this manner.

When I first began to plant, I put in mixtures of six or eight sorts, one-half being generally larch and pines, and the other half hard wood; but this was much more expensive than my present plan, and not so successful as it promises to be.

The subsoil of my hills is a yellow clay loam, over which is a stratum, generally thin, of peaty earth, and frequently a hard ferruginous layer, or *pan*, as it is here termed, six or eight inches below the surface.

The trees grow very slowly until their roots reach the subsoil, and it is our endeavour, if possible, to get them at once into it. Of this I had one clear proof. A plantation was intersected by several old foot-paths and moss-roads, from which the peaty surface, and also the *pan*, had been worn away. The trees planted in them took the lead of their neighbours from the first, and still retain it. This circumstance induces us sometimes to use the spade in planting, where we would otherwise prefer the planting-iron.

In regard to the growth of the young trees, they appear to spend the first two seasons almost entirely in establishing their roots, and make very little progress at top; the third year they begin to shoot, making a growth of perhaps six inches. Each succeeding year they make longer shoots; and when six or seven years established, their annual growths are often from eighteen to twenty-four inches. This season (1837), which has been very favourable to wood, I have measured growths in larch six or seven years planted, and

found them from two feet six inches to three feet long, and apparently well ripened.

Two of the greatest enemies to young trees are wholly beyond our control, viz. late frosts in spring, after they have begun to grow, and a wet autumn, inducing them to grow too long, and preventing the wood ripening before the winter frosts set in. I find that generally woods with a northern aspect suffer less in this way than those which lie to the south-east and south. We usually commence our planting about the middle of November, and continue, as weather permits, to the middle of March, if the work for the season be not sooner accomplished. I see little difference betwixt the autumn and spring planting; the former is more exposed to injury from severe frosts throwing out the trees, and the latter to droughts in April and May.

Where it is desirable to force forward a young plantation, I find no plan equal to the following: Dig over the ground before planting, taking care to bury carefully the whole surface; put in two-year transplanted trees, or even larger if wished, and keep the ground under the hoe until the side branches meet, which is generally in three or four years. My cottagers frequently do this for me for the permission to plant cabbage or greens among the trees for the first two years; and the progress made by trees thus treated is astonishing, when compared with those which are left to fight their way among grass and weeds. Three hoeings in a year are generally quite sufficient, and, when paid, the whole three are commonly done at less than a pound per acre, which is well laid out when speedy growth is required. I do not see that it does much good after the side branches begin to meet. As to the after management of plantations, I would only say, that, in thriving woods, if properly *thinned*, very little pruning will be necessary, while the thinning must be regulated by the situation and growth of the trees. It is in general much too long deferred, and, when commenced, too much is

done at once. Thinning ought to be begun within a very few years after planting, and go on yearly until the wood have arrived at maturity. This, however, is an immediate expense, with only a prospective return. Thus proprietors are induced to wait until the *thinnings* become saleable, to the great injury of those trees which remain.

The diseases of trees form a subject of which at present we are very much in want of information. The white insect on the larch prevails here in some seasons to a great extent, but I cannot say I have ever seen a tree fairly killed by it, though I have seen many disfigured for life. Three years ago a somewhat similar insect was observed here on the silver fir, which, however, killed some of them outright. It is larger than the larch insect, but I have never seen it in its winged state. The eggs are laid in clusters on the bark, and are hardly visible without a microscope. As soon as they come alive they seem to insert their beaks into the wood, and soon work up a white cottony covering for themselves, until, if they be numerous, the tree looks as if the trunk and branches were white-washed. In this state the insect is under one-tenth of an inch in length, flat, with eight legs, and a sharp snout. I have seen it on trees of all sizes, from seedlings to sixty years of age, and I have not seen it on any tree except the silver-fir. As those trees we first observed to be infected here happened to be ornamental, I tried various plans to cure them. Coal-tar was applied; this of course destroyed the insects, but also destroyed the trees when a great part of them had to be covered with it. Soft-soap was next tried; this was fatal to the insects, but very hard also on the trees. Though none of them absolutely died, yet they immediately shed a great part of their needles, and made no growth that season. It occurred to me, that if the insects could be deprived of air for a time, it would destroy them. I therefore had some clay carefully mixed with water till it was of the consistency of thick paint, and quite

smooth. This was put on with a brush wherever the insects were seen. It speedily dried, and we saw no more of the insects that season, while the trees did not suffer. They had a very strange appearance for a time, but wind and rain gradually cleaned them. This is by far the easiest application, but, of course, such remedies are only to be thought of for ornamental or favourite trees. Our operations seem, to a certain extent, to have checked the progress of the insects, as we have seen very little of them for the last two seasons. Two other diseases attack the larch, which are very serious. We frequently find trees to all appearance perfectly healthy, and yet, when cut, they are either decayed, or entirely hollow at the heart. This is said to happen when larch has been planted *after* a crop of Scotch fir; and if so, it would prove that the matter deposited from the roots of the fir was hurtful to the larch; but we find only one tree here and there affected in this way, while those next to them are perfectly sound. I must say, however, that we have not yet observed any case of it, except where Scotch fir had grown before. The most annoying feature of this disease is, that we have not been able to detect any external mark of it whatever; so that, in thinning a plantation, we run the risk of cutting out the healthy and leaving the diseased. Nor do we find that, being too thick or too thin, a damp or a dry situation has any influence upon it. The subject is altogether perfectly obscure; nor does it seem very easy to plan experiments which would throw clear light upon it; but it well deserves the attention of the botanical physiologist. The other disease to which I have alluded is a canker, which attacks the stem of the tree at any age and at any height. It appears first like a small blister, from which a little stream of resin trickles down; it eats in deeper and deeper every year, till the tree dies. It is not very common, and sometimes cures itself. It appears from the state of the trees when cut down to arise from a superabundance of resin. We are trying to cure it by exci-

sion of the diseased part, and apparently with success; though, if it arise from too much resinous matter being taken up by the roots or elaborated by the leaves, it is not easy to see why it should thus be cured. It seems most common on very dry spots, and attacks the Scotch fir as well as the larch.

I annex a statement of the extent of ground planted. Nos. 1 to 6 inclusive, are in Kincardineshire; No. 7 is in Aberdeenshire, about twelve miles north-east of the city, and five miles from the sea. The situation is high, and the adjoining country is bare of wood. The ground is covered with short heath, and the soil is dry gravelly clay, apparently well adapted for wood. It was planted in 1832, and is now very thriving. It was managed nearly as the Banchory plantations, except that a few thousand hard-wood trees were planted at first, which have done little good; and in 1836 it was filled up with transplanted trees from my own nurseries, as stated in the table.

I have also given a correct state of the expenses of the plantations executed last year (1836), which I consider a fair average; for, though the situation happened to require less draining than usual, the higher prices of the larch trees may be considered as compensating the saving of expense on drainage.

The whole of my plantations are at present, November 1837, looking better than, all things considered, I could reasonably have expected. The larches are growing more rapidly than the Scotch firs; and, in plantations of five or six years old, the former are generally double the height of the latter.

I have tried many new trees in sheltered situations, and with success; whether they may prove useful timber cannot yet be said, but they form a pleasant variety in their present state. The only sorts I have tried on the hills are a few pinasters and Cumbrian pines. The former look sickly, and

the latter very healthy, and, though growing slowly, I think they are to succeed.

In conclusion, knowing how paltry my plantations must appear to many of our extensive Highland planters, they have nevertheless one merit, that they are tried in a most ungenial situation (I mean those in Kincardineshire), and I have some hope, should another annalist of Captain Dugald Dalgety appear some twenty or thirty years hence, he may be compelled, thanks to draining, trenching, and planting, to speak in other terms of "the long waste moor that lies five miles to the south of Aberdeen."

Measures of Plantations.

KINCARDINESHIRE—measured by Mr James Keith :				Acres.
No. 1.	Sharp's Brae, 1833,	.	.	13.04536
2.	Hillside, 1833,	.	.	2.41201
3.	Clodhill, north and east sides, 1833-36,	.	.	14.55878
4.	Bluehill, 1834-35,	.	.	8.04005
5.	Clodhill, south and west sides, 1836-37,	.	.	7.66168
6.	Greenhow Wood, 1836-37,	.	.	15.15783
Extent in Kincardineshire,				60.87571
ABERDEENSHIRE—measured by Walker and Beattie, Aberdeen.				
7.	Kingseat Wood, 1832,	.	.	36.85019
Total Acres,				97.72590

Notes of Trees planted on Kingseat.

Larch,	.	.	.	90,000	} Seedlings.
Scotch fir,	.	.	.	30,000	
Spruce,	.	.	.	7,000	} Transplanted.
Ash, oak, beech, elm, and plane, 500 of each,	.	.	.	2,500	
Birch,	.	.	.	1,000	
Tree laburnum,	.	.	.	1,000	
				131,500	

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Filled up in 1835-36, from Banchory nurseries, with

Transplanted larch,	5,000
Do. Scotch fir,	.	.	.	.	2,000
Do. silver-fir,	.	.	.	.	300
Do. beech,	.	.	.	.	500
Do. mountain-ash,	.	.	.	.	200
Do. oak,	.	.	.	.	1,000
					<u>9,000</u>

Expense of Plantations 1836-37.

1. Clodhill, south and west side,	Extent in acres,	7.06
Fence, 817 ells, at 1½d.	L.5	2 1½
Plants, 20,000 Scotch fir, at 10d.	L.0	16 8
23,000 larch, at 2s. 6d.	2	17 6
1,000 alder, at 8s.	0	8 0
		<u>4 2 2</u>
Planting—Forester, 13½ days, at 1s. 6d.	L.1	0 6
Labourer, 10½ do. at 1s. 2d.	0	19 3
		<u>1 19 9</u>
Total Expense,	L.11	4 1½

Expense per acre, about L.1 10 0

Plants per acre, about 5,800

Rate of planting per day of 7 hours, about 1,460

2. Greenhow plantation,	Extent in acres,	15.16
Fence, 1646 ells, at 1½d.	L.10	5 9
Ditch, 50 ells, at 1½d.	0	6 3
Plants, 40,000 Scotch fir, at 10d.	L.1	13 4
40,000 larch, at 2s. 6d.	5	0 0
1,000 alders, at 8s.	0	8 0
60 Huntingdon willows,	0	2 0
		<u>7 3 4</u>
Planting—Forester, 23 days, at 1s. 6d.	L.1	14 6
Labourer, 23 do. at 1s. 2d.	1	6 10
		<u>3 1 4</u>
Total Expense,	L.20	16 8

Expense per acre, about L.1 6 8

Plants per acre, about 5,400

Rate of Planting per day of 7 hours, about 1,750

ACCOUNT OF EMBANKING LAND FROM THE RIVER TAY ON
THE ESTATE OF PITFOUR, PERTHSHIRE. *By Sir JOHN
STEWART RICHARDSON, Bart.*

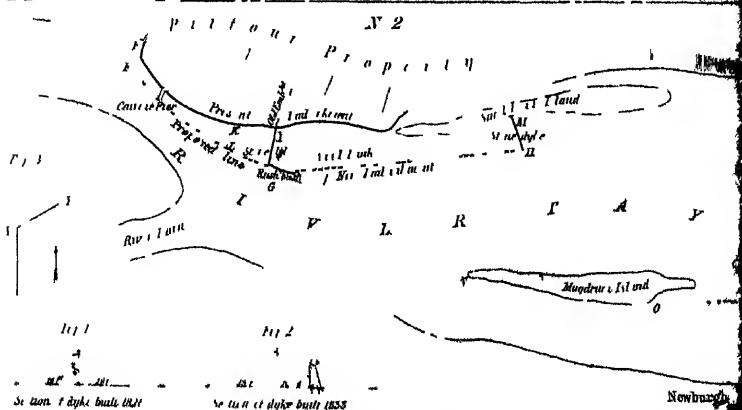
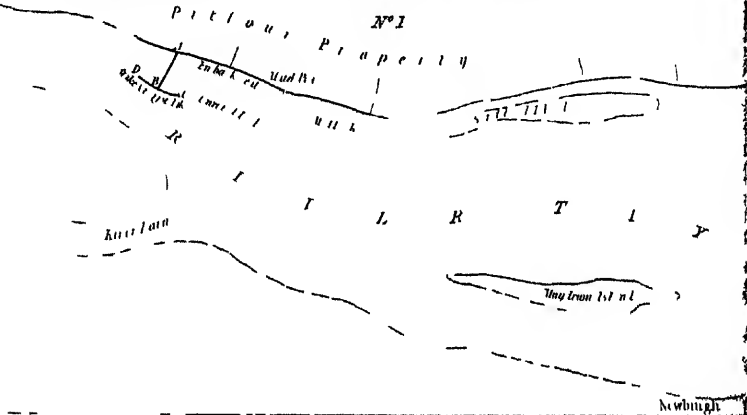
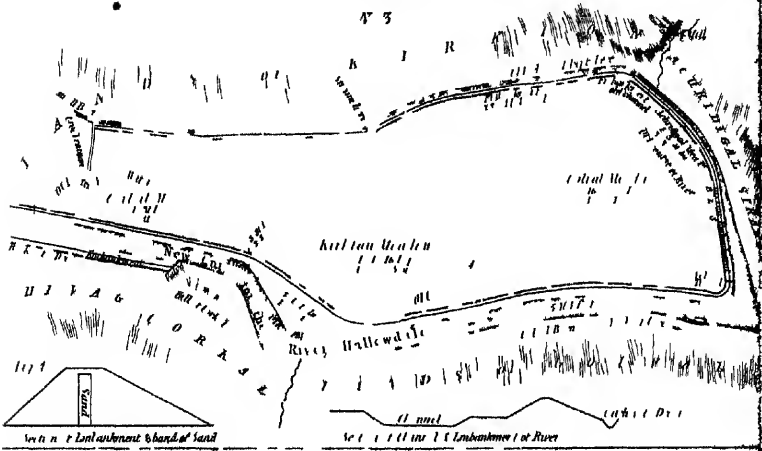
[Silver Medal.]

THE last embankment which I erected was in 1833, when I enclosed a space of eighteen acres Scots; but in order to give a more distinct account of the means employed for reclaiming this portion, I think it is desirable that I should at the same time embody in this report a short account of 50 acres Scots, which were embanked on this property in 1826, the expense of which was borne by the tenant, Mr Walker Rannie, in consequence of an arrangement between him and myself that he should have a lease of nineteen years at a deduction of 30s. per acre of annual rent, and that he should possess the land rent-free the season after it was enclosed. The rent offered was L.6 per acre if embanked by the proprietor, or L.4, 10s. if embanked by the tenant. In the year 1808, my grandfather commenced those operations which formed the nucleus of the sixty-eight acres, which I have reclaimed within these ten years, and which in the course of time will be the means of acquiring at least twice as much as I have already gained.

In the accompanying sketch, No. I., Plate VII., I have laid down the existing state of the river Tay in 1808, with the addition of the faggot-dykes, which eventually accumulated a sufficient depth of soil for embanking. These dykes are represented by the strong lines AB and CD. They were strong bulwarks consisting of three lines of stakes nine inches apart—the whole of the interior being filled with faggots, which were allowed to project a considerable distance on each side of the dyke to save the stakes from being damaged by the floating ice in winter. The first coating of faggots was an average of about five feet deep. A second course of stakes and faggots was added in 1811, also five feet high, and afterwards a course of mud six

PLATE VII

English / 2 N. 10. 1850



feet high was laid above all, and a mud dyke six feet above these. The accumulation of mud was found to be greatest on the flood side of the dyke. I have uniformly found this to be the case, thereby proving that although the deposite may originally come from the higher parts of the country and settle on the banks in the wider channel of the river, still it is from the effect of the flood-tide raising this thin coating of mud and depositing it in the eddies that the greatest accumulation is to be looked for. If I am correct in the opinion which I have formed, it appears that it is only in the tide-way of the river that new land can be formed to any great extent. The accumulation was so great that in 1826 there were about seven and a half feet of mud on the flood side, and about five and a half feet on the ebb side of the main arm A. B., which was 300 yards long. In order to ascertain the practical working of these operations, in reply to a series of queries which I put to the tenant, I have obtained from him the following information, viz. the whole expense of embankment, sluices, levelling, water-cuts, and trenching of fifty acres was about L.1530, the average level being about eight feet below high water mark. He has had of potatoes on some parts of a field, *before liming and manuring*, about sixty bolls per acre; the average produce being from forty to fifty bolls. He has also had on some parts, *after liming and manuring*, seventy bolls per acre, the average being from fifty to sixty bolls of thirty-two stones Dutch to the boll.

He has had of oats, *before liming and manuring*, from twelve to fourteen bolls of six bushels per acre. *After liming and manuring*, of oats from twelve to sixteen bolls of six bushels, and of wheat from ten to twelve bolls of four bushels per acre. He commenced liming in 1829, and manuring in 1835, the rotation up to that period being alternately potatoes and wheat, or oats, for eight years yielding the above produce. He recommends oats in preference to wheat, the latter being very apt to lodge from its luxuriance. He recommends wooden as

preferable to stone sluices, as the latter are apt to be displaced by the settling of the dyke. He says it is difficult to prevent vermin lodging in the dykes, and knows no efficient remedy, but thinks that if the slope of the embankment were such as to allow of the inner bank being cultivated no great damage could arise from vermin. Besides this remedy I think it is a good precaution to have the grass on the dyke mowed very close in the autumn, so as to leave as little shelter as possible.

The above account of the fifty acres possessed by Mr W. Rannie is essentially applicable to the eighteen acres which I embanked in 1833, with this exception, that on account of the latter space which was enclosed being narrower than the former, and as it was exposed to a heavier sea, and required the protection of a stone wall outside, these eighteen acres cost about L.1200, whereas the fifty acres cost only L.1530. I may, however, mention that for about seven acres of the fifty, which were given up by Mr Rannie for the same extent of the newly reclaimed land, I now receive L.7 per acre.

In the accompanying sketch, No. II., there are sections of the dykes, Figs. 1. and 2., erected in 1826 and 1833, both of which have been found quite sufficient to resist the force of the river.

In sketch No. II., the strongly dotted line, E F G H indicates the extent of land which will naturally accumulate from the eddies formed by the sea-dykes K L and I G, which are at present in progress—H M having been thrown out some years ago. If, however, the various conflicting interests could be so far reconciled as to allow the small dotted line G N O P to be carried through, there would be added to the Carse of Gowrie a tract of land, equally rich with that which I have now described, extending to many thousands of acres.

I am at present in correspondence with some parties interested in the promotion of this scheme, which was originally suggested by my grandfather forty years ago; and I trust that, before other forty years are gone, the now barren sand-

banks of the estuary of the Tay may be converted into fertile fields.

The average depth at low water in the line G N does not exceed three and a half feet.

I have now for twelve years watched attentively the progress of the formation of soil in the river Tay, and to those who are engaged in similar undertakings I would venture to throw out the few following suggestions.

During the process of formation of land in this manner the chief point to be attended to is the filling up of those runs which are always formed by the receding tide, and which has been done here by placing small faggot dykes across them. Latterly, I have made those dykes rather lower in the centre than at the ends, which has had the effect of preventing any cut from being formed at the extremities.

In order to assist the accumulation I, in the autumn of 1835, tried, on a limited scale, the experiment of planting spadeful of bulrushes on those banks where the mud was only beginning to be deposited. It has succeeded beyond my most sanguine expectations, and has had a most wonderful effect in consolidating the bank and retaining a very large proportion of the mud that rested on it. It is my intention to continue the same system every year on a much more extended scale, having built a boat for the express purpose.

In those cases where a small annual expenditure is more convenient than a considerable outlay at the commencement, I should recommend that after having completed the dyke projecting into the river, which is to cause the eddy where the mud is to be deposited, a foundation of a single course of stones should be laid along the line where the embankment is ultimately to be placed. This will have the effect of retaining the mud which has been deposited, and may be gradually increased in height according to circumstances. It is, however, at all times necessary to slope the termination of the stone wall gradually down till it is merely composed of gravel or

quarry-rubbish, thereby preventing the current from cutting a deep hole which would certainly be the case if the stone dyke were terminated abruptly.

If it is found that the depth of water is too great for carrying on the proposed line of dyke, in most cases a bank will be raised if a jetty is thrown out as indicated by the line X Y, in Fig. 3.

ACCOUNT OF RECLAIMING LAND BY EMBANKING THE RIVER HALLOWDALE IN SUTHERLAND. *By Mr DONALD CLARK, Blervie near Forres.*

[Silver Medal.]

THE land which is the subject of the following statements is a part of the estate of Bighouse, in the county of Sutherland. It forms a meadow, containing about 222 acres, quite level, and composed of fine alluvial deposit five feet in depth, almost without a stone. The meadow produced hay annually to the extent of 250 stones per acre; but it was constantly subject to the inundations of the small river Hallowdale, which takes its rise among the adjacent mountains, and which wound a devious course through it. In rainy weather the meadow was so covered with water that a boat might have floated across it, and even after a thunder storm of only two hours' duration it was generally covered with water. During these inundations the river brought down large quantities of sandy matter, which covered the face of the grass, and rendered it unfit for the action of the scythe.

The protection against such attacks on so large a piece of ground was a desirable object of the late proprietor of Bighouse, Major Colin C. Mackay, who, in the spring of 1830, entered into a contract with the writer for the straightening and embanking of the river Hallowdale. Before the works

had been completed in October 1831, his Grace the Duke of Sutherland became proprietor.

The expense of so large an undertaking was of course great, but not more so than the object to be attained warranted, as will appear from the following statements. The expenses of straightening the river Hallowdale, and embanking the meadows on both its banks shall first be detailed, and then the operations on the opposite side of the Bighouse meadows next the mountainous range shall be specified.

"The new channel for the river was 5463 feet long, 34 feet wide at bottom, 4 feet 8 inches of perpendicular depth, and about $53\frac{1}{2}$ feet wide at top; consisted of 39,181 cubic yards, which was cut for 4d. per cubic yard of the excavation, including the wheeling of the soil 15 feet from the brink, for the purpose of forming the embankment on one side, and cost L.653 0 7

Piling of 1234 ells of the edge next the river at the round hill of Corkall, delineated on the plan in Plate VII., No. III., was necessary; they were driven 6 feet into the ground, 3 inches apart, packed at the back and front with stones which proved quite effectual, and cost 146 0 3

Forming of the excavated earth into an embankment on one (the meadow) side of the channel, (unless through the old channel and on the old line after mentioned), 2 feet wide at top, $9\frac{1}{2}$ feet high, and about 45 feet at bottom, slope of 2 to 1 next the river and 3 to 1 next the meadow, the side next the river turfed, was done as follows:

1180 ells, at 7d.	. L.34	8	10
113 ells, at 4d.	. 1	17	8
48 ells, at 8d.	. 1	12	0

————— L.37 18 6

Forming of an embankment of the same dimensions as the above, for conducting the water from the new cut into the old at the bottom of the hill, where piled cost 3d. per cubic yard, as the materials had to be carried from the opposite side on the hill, 3,350 cubic yards, 41 17 7

Forming of an embankment for conducting the course of the old again into the new

Carried forward,	. L.79	16	1	L.799	7	3
				(v 2)		

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Brought forward, . . .	L.79	16	1	L.799	7	3
channel, cost 5d. per cubic yard,—contents 4,064 cubic yards,	84	13	5			
Forming of embankment on the old line of the river, which was continued, and which in consequence had to be made from mate- rials from the opposite side, cost about 6s. per lineal ell,	420	0	0			
Cost of placing stones at the edge of part of the new course, where it threatened to cut,	9	0	0			
Removing part of the round hull at “Cork- all,” to make room for the new course, and to make up part of the embankment, and turving the broken surface after its re- moval, cost	43	0	0			
Fitting in wooden tunnel, with hinge valve thereon, at the end next the river, to convey the contents of back water from catch-water drain, 3 feet by 2 feet, and more than 40 feet long, cost	8	8	0			
Additional height found necessary for some parts of the embankment, turving the top of the embankment, and some slight altera- tions, cost	39	17	9			
Repairing an old embankment, and form- ing 796 ells new, to protect the meadow at Hevag, cost, the former 1s. 5d., and the latter 4s. 6d., 2s. 5d., and 4s. 10d. per li- neal ell, according to the access to mate- rials, including the turving on the side next the river, height 9½ feet, breadth at top 2 feet, and slope of 2 to 1 next the course, and 3 to 1 next the meadow,	220	7	9			
Additional height given to part thereof (644 ells) by materials taken from the opposite side of the channel, and which had also the effect of widening it, cost 2s. 4d. per lineal ell,	75	2	8			
Levelling the ground where materials were taken from, turving the top of the lower part, and putting in a small funnel and valve at						
Carried forward,	L.980	5	8	L.799	7	3

Brought forward,	L. 980 5 8	L. 799 7 3
the base of the round hill on the catch-water drain, cost	15 12 6	
Cutting the catch-water drain along the back of the main embankment, on the large meadow side, $1\frac{1}{2}$ feet at bottom, 6 at top, and 3 deep, 720 ells at 4d., and 1334 at $2\frac{1}{2}$ d., cost	26 0 0	
Cutting catch-water drain at the back of Hevag embankment at the upper end, of the same dimensions as the last, cost (including a hill drain carried therein)	17 13 4	
There was formerly a burn at Golval, striking at right angles to the old course, and tending to divert the channel, it was therefore drawn in a slanting direction, and emptied into the main channel near its outlet, and protected on the side next the river by an embankment; the cut was 5 feet at bottom, with slopes of 2 to 1, 1787 cubic yards at 4d., of the excavation, cost, including the embankment,	29 15 0	
And other small rills carried into the last, not marked on the plan, cost	5 3 0	
	<hr/>	1,074 10 0
		L. 1,873 17 3

Expense of operations on the opposite side of the meadow :—

“The mountain streams emptied their contents on the meadow quite unprotected; it was therefore resolved to collect the whole into one channel at the base of the hill, and on the margin of the meadow, with an embankment on the meadow side only; the channel was 16 feet wide at bottom, 4 feet deep, and had slopes of 2 to 1; the embankment was 8 feet high, 2 feet wide at top, and had slopes of 2 to 1 on the side next the course, and 3 to 1 on the meadow side, all executed at 4d. per cubic yard of the excavation,—11,791 cubic yards, L. 196 10 7

Forming an embankment across the old channel opposite Straan-Dhu, of the fol

Carried forward,	L. 196 10 7	L. 1,873 17 3
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Brought forward, . . .	L.196 10 7	L.1,873 17 3
lowing dimensions, 9 feet broad at top, 7½ feet high, with slopes of 2 to 1 on both sides, and covered with turf, cost 9d. per cubic yard, as most of the materials had to be taken from the opposite hill side,—		
8,390 cubic yards,	814 13 0	
Forming an embankment across the next part of the old channel, opposite the stream at Auchridigal, cost 4d. per cubic yard, say 1747 cubic yards, and piling the part opposite the stream, cost	31 2 2	
287 ells of embankment formed along the side of the old channel of the river, commencing as last mentioned, and terminating at the next cross embankment, as the materials had to be carried from the hill, cost 5s. 4d. per lineal yard,	76 10 8	
Continuation of the embankment which passed through the old channel of the river, was 1751 cubic yards, and cost 4d. each,	29 3 8	
Part of the embankment at the upper end was formed of materials not excavated, and at an expense, 150 ells at 1s. 6d, and 360 at 1s. 8d. per lineal ell,	41 5 0	
Turfing part of the top of the embankment, and of part of its base, cost	9 3 9	
Catch-water drains at the back of the foregoing, cost 2d. and 2½d. per lineal yard,	23 8 0	
Streams formerly falling unprotected into the meadow, were guided in a slanting direction to this new channel, say 233 ells at 11½d. per lineal ell,	11 3 3	
Auchridigal mill stream, 253 ells at 3d.	3 3 3	
And the embanking thereof, including filling up of part of the old channel, cost	11 10 0	
And the direction of another hill stream half-way up the course, 620 ells at 2½d.	6 9 2	
There were some trees standing in the middle of the meadows, and on rising ground,		

Carried forward, . . . L.754 2 6 L.1,873 17 3

Brought forward, .	L.754	2	6	L.1,873	17	3
which were cut down, the ground was trenched and levelled, say 5 acres 1 fall, at L 8 per acre,				40	1	0
						<hr/> 794 3 6

N.B.—The stagnant water still stands in the *old* channel of the river, which cannot be filled up for want of proper or convenient materials.

MAKING THE TOTAL EXPENSE, . L.2,668 0 9"

All these operations have realised the most sanguine expectation. The meadows in their former state would not have let above 15s. per acre. It is difficult to ascertain what they would now be worth under tillage, as the late Duke of Sutherland expressed a wish they should not be cultivated, but it may safely be affirmed that they are not worth less than 40s. or 45s. per acre. The outlay has thus been profitably expended. The annual interest of the outlay of L.2668 is L.133; the former value of the meadows at 15s. an acre was L.166; the increased value of the same by these operations is at 40s. an acre L.444, leaving the sum of L.278 of gain, or fully 10 per cent. per annum on the outlay.

It may be mentioned that a lake at the top of one of the distant hills poured at times such a vast body of water into the river, that its late outlet became banked up, and the stream from it was led down the opposite side into a strath where it could do no harm. The cost of this operation was L.85.

The writer, in conclusion, may mention that the most effectual mode of protecting embankments from the inroads of moles, he has found to consist of a band of pure sand or loose gravel placed in a perpendicular direction down the middle of the embankment. The loose sand prevents the burrows remaining open. A section of an embankment with the band of sand will be found at Fig. 4. No. III.

ON THE CONSTRUCTION OF RESERVOIRS OF WATER FOR
AGRICULTURAL PURPOSES

I.—By Mr JAMES ADAM, W. S., *Edinburgh*.

[Five Sovereigns.]

THE progressive improvement of agriculture and the useful arts, has recently led to the practice of collecting or retaining water for the use of canals and the impulse of machinery of various kinds ; and the proper selection of localities for such collections of water, has become a subject of great importance.

In the choice of a situation for collecting water, it is proper, in the first place, to examine the extent of ground from which the water is to be derived, and from that to calculate the supply.

By the recent publication of the Statistical Society of Glasgow, it appears that from 1801 to 1836 inclusive, the average fall of rain at Glasgow was 22.175 inches, at Bothwell Castle in 1815, 24.677, and at Greenock 36.763.

The fall of dew has not been so well ascertained, but Messrs Dalton and Hoyle of Manchester, estimate it at 5 inches.

The evaporation, according to Professor Leslie, is daily in a sheltered place in winter 0.018 inch, and in summer 0.018 inch. The estimate of Doctor Hugh Colquhoun of Glasgow, kept from May 1823 to February 1824 inclusive, being ten months, was 1 foot 3.179 inches. The medium of these will be nearly 1 foot 2 inches for evaporation, which deducted from the medium fall of rain (independent of the dew) leaves nearly 1 foot, to pass to the sea, and which may be turned to use.

A pretty accurate estimate may thus be formed of the supply of water to be annually derived from any extent of ground, as one acre will thus, during a year, yield 43,560 cubic feet.

A dam for a thrashing-mill should not contain less water than is sufficient to thrash at least one stack at a time.

Having ascertained the fall that can be obtained between the outlet of the dam and the mill, the power is found by the quantity of water and the amount of fall in feet; then multiplying the weight of water in pounds, by the number of feet fallen, and dividing the produce by 33,000, gives the horse's power. Suppose the supply of water to be 8 feet per second, the effective fall to the mill to be 11 feet, then,

$$\frac{11 \times 8 \times 62.5 \times 60}{33,000} = 10 \text{ horses' power, } 62.5 \text{ lb. being the weight}$$

of a cubic foot of water.

In turning an overshot or breast-wheel, however, it is usual to calculate that one-third of the estimated power will be lost by friction, waste, &c., so that only two-thirds of this estimated power is effective, that is, in the above case, 7 horses. In a well-constructed thrashing-mill, every such horse-power will effect the thrashing of $1\frac{1}{2}$ boll or 6 bushels of wheat per hour, so that a mill-dam, capable of containing 28,800 cubic feet of water, affording 8 feet per second, will in one hour thrash out about 40 bushels of wheat, and a dam of one rood in extent and three feet deep, will contain sufficient water for that purpose.

A dam, however, of sufficient capacity to answer a day's work, and collect all the water flowing during the night will be found useful, either for the use of grinding or thrashing mills, and these small or night dams ought to be situated near the mills, while more extensive reservoirs may be constructed at greater distances to supply the wants of summer or of dry seasons.

The line of the damhead being fixed on, a foundation may be marked off, corresponding in breadth to the height of the bank, and this foundation is to be cut down to the solid substratum of rock or other solid substance impervious to

water. Where it is of clay or till it may be cut to the depth of two feet or thereby.

The materials proper for the purpose of the embankment are chiefly clays. Light peat-earth is to be avoided, but heavy black peat-earth, if properly mixed with small stones, may answer when no better materials can be found.

The bottom being prepared by cross cutting with the spade, and moistened with water (if necessary), the first layer of the bank is to be laid on to the depth of about six inches, and gone over with the spade, and if of a dry consistence, it must have plenty of water poured over it, and carefully and regularly tramped and wrought by the feet of men, till it be thoroughly mixed and incorporated. The proper working of this puddle is a most material part of the operation.

If peat-earth is the only material to be found, each layer must be covered with small stones or clean gravel, which must be carefully beat into it by stampers, such as those used by paviers, till every part is equally filled, and the earth can receive no more.

The work should be continued layer upon layer until the trench is completely filled, and it should then, in like manner, be extended over the whole area of the embankment, and care taken to incorporate the first bed of puddle with the subsoil; the next layer should be extended equally over the whole area of the embankment, and each layer wrought into the one immediately below it, as before directed; frames of wood being erected to guide the workmen as to the form of the bank. The work will thus proceed until completed, care being always taken at the ends of the embankment to have the natural banks, against which the ends rest, cut open to the solid subsoil, and the puddle incorporated therewith, as in the bottom part of the bank, until the ultimate height of the bank is attained.

The whole embankment is thus one mass of solid puddle; but as the depths are necessarily unequal, it will sink un-

equally, and it ought, therefore, to be allowed at least six months for subsidence, and then the upper part must be opened and wrought with the puddle-spade, as before described. To prevent the entrance of moles or water-mice, the whole may have a stratum of small stones beat into it to the depth of three or four inches.

The usual specification for an embankment of this extent is, to provide a puddle-wall of clay in the centre, to terminate at the top in a breadth of four or five feet, and to have a batter of three inches to the foot on either side, and thus increasing in breadth as it descends to the bottom. Where puddle materials are to be brought from a distance, this plan may be adopted, and may with great care be made scouré; but it is not so strong or so entirely to be depended on as when the bank is entirely formed of one solid body of puddle.

In both cases, when the embankment is settled down and brought to the height, the slopefronting the water must be covered with a facing of stones, of from half a pound to two pounds weight, to the depth of six inches; and above that a layer of larger stones from two to four pounds weight, so as to form altogether a facing of stone of at least one foot in thickness.

At an angle of about fifteen degrees, this mode of covering is much cheaper, both at first and in maintenance, and also more safe than the pitching or causewaying generally specified; for when in the latter case the under part of the causeway is displaced, the whole extent to the top gives way, and exposes the bank to the waves. But though a few stones placed in the first method may be deranged, those above or beside them take their place; and in repairing, nothing more is necessary than to fill up the breach with additional materials. The back part of the bank may either be sown with grass seeds or covered with turf, and a road formed along the top and properly gravelled and edged with turf.

A tunnel for carrying off the water, for the use of ~~mills~~ or other purposes, from the bottom of the reservoir, on from ~~near~~

its bottom, must be made across the embankment ; not in the original channel of the river, but on firm ground near it, at such a level as may nearly empty the reservoir. This must be constructed of solid mason-work, and arched over.

The foundation of the tunnel must be laid upon a stratum of concrete mortar, resting upon rock, firm clay, or other compact substance.

At the highest part of the embankment, and over the tunnel, a well-hole or shaft of masonry, communicating with the tunnel, must be made. The void of this shaft measuring six feet by three feet, is formed towards the void with square masonry, and backed with rubble-work.

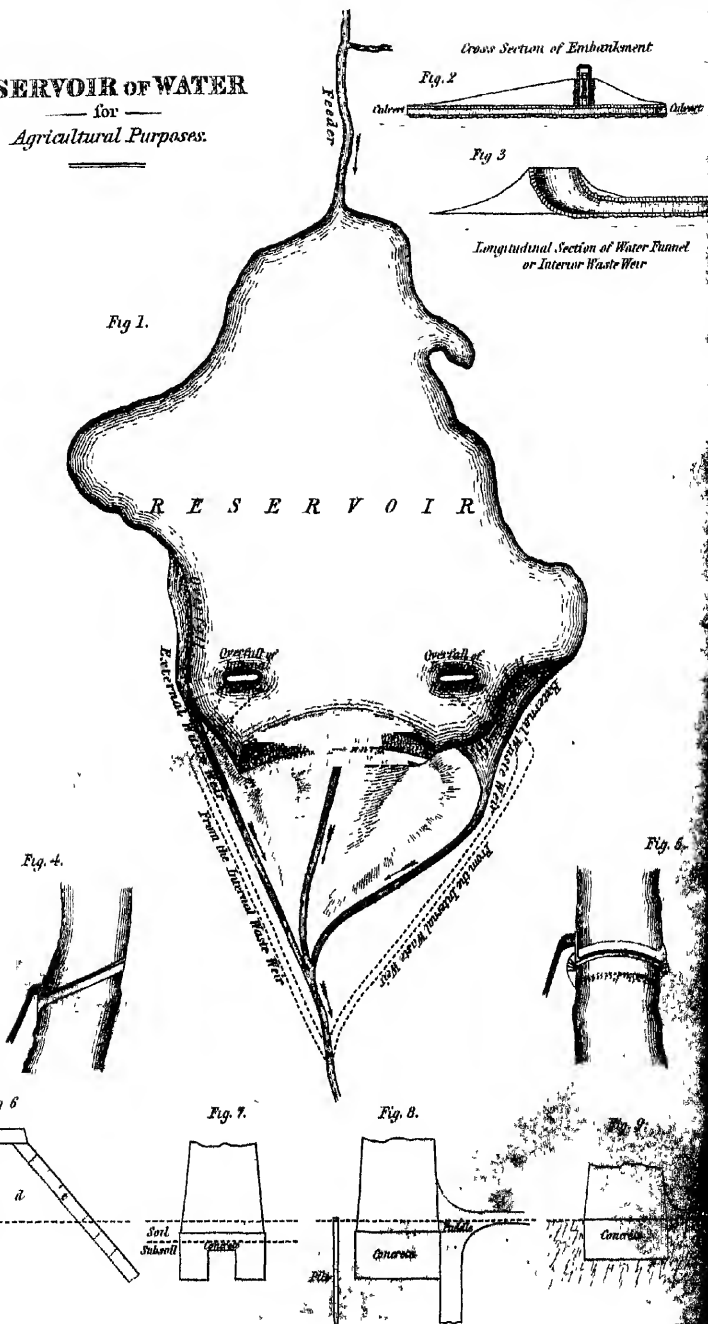
The horizontal tunnel must be built before the puddle-bank is begun, and the puddle carefully rammed against the mason-work, and into all the interstices left therein, and the shaft must be carried up as the bank advances, and joined to it in like manner.

The sluices are most conveniently placed perpendicularly in the bottom of this shaft, and may be divided into two or more compartments, set in strong frames joined to the masonry, and made water-tight all round, each sluice being wrought by a screw set in a frame on the top of the bank.

The waste weirs for letting off the surplus waters are most essential to the safety of a reservoir, especially if placed on a river or rivulet.

When a foundation of rock can be had, the overfall should be conducted over it, and kept at a distance from the dam-head until it rejoin the natural stream ; and it should be cut out of sufficient depth to receive the whole surplus-waters in the greatest floods ; and for perfect safety, double that extent should be excavated. The greater the breadth of overfall, the less the rise will be and the more gently the waters will flow over ; this extreme breadth need not, however, be continued in the waste weir, but may be gradually contracted as the weir descends.

RESERVOIR OF WATER
for
Agricultural Purposes.



When rock cannot be got for the waste-weirs, situations must be chosen separate from the embankment in firm and solid ground, into which an excavation must be cut, down to the solid substrata, of sufficient width to admit of a bed of puddle, upon which a causeway, similar to that specified for the bottom of the let-off tunnel, must be made. At the summit, where the overfall takes place, three inch planks joined together in pitch and made water-tight, may be inserted about three feet deep in a puddle-bed, and carefully secured at the ends, and from thence, on the inside, towards the water, the causeway must be continued inwards for about twenty feet, until it meet with a solid foundation.

Instead of the external overfall here described, there is, however, another method of letting off the water by an internal overfall, whereby the embankments remain altogether entire. (See plan Fig. 1, and section, Fig. 2, Plate VIII). The beautiful simplicity of this method is recommended by thirty years' experience, in the outfall of a night-dam, near Johnston, made for one of the large cotton-works erected on the river Cart, and which has, during that period, been in constant operation.

In forming this kind of outlet, there must first be formed a culvert or small tunnel from the bottom to the tail-race through the solid ground into the reservoir; it is not necessary that it should be so deep as the reservoir. The puddle and masonry must be made secure in the way specified for the let-off tunnel. After it has been brought for twenty or thirty feet into the area of the reservoir, a shaft or well of masonry is raised and surrounded by puddle to near the highest level of the water, and a boundary of three inch plank then inserted to a sufficient depth in the puddle and secured in the masonry. The upper edge of this planking will stand a few inches below the highest rise to which it is intended the waters of the reservoir should rise, and which will then flow over *into* it and be discharged by the culvert or tunnel. By extending the mouth

of this tunnel or internal overfall, the water may be regulated so as never to rise more than a single inch.

Figure 1. shews a reservoir with the embankment and two overfalls. On the same figure are shewn the mouths of two internal overfalls. The sections, Figs. 2 and 3, shew the internal construction thereof.

When reservoirs of great extent are required, they may be formed and made perfectly secure on the same principle, care being taken to proportion the depth of the stone facing to the weight of the waves which the wind can at any time impel against the facing.

II.—By Mr JAMES R. FINDLATER, *Civil Engineer, Dundee.*

[Five Sovereigns.]

THE husbanding of water is now becoming a subject of peculiar interest to the agriculturist. This arises from its scarcity in many districts, in consequence of the improvement of the land, and from the many uses to which machinery may be applied in farming operations, by the agency of water power.

In order to elucidate this subject, it will be necessary to arrange it into different schemes, or modes by which a supply may be secured, some one of which will either naturally present itself, or must be resorted to, as being applicable to the resources of any particular situation requiring water; and in the description of those different schemes, every necessary operation in such works shall be detailed. These schemes may be classed as follows:—

First, Where a sufficient quantity of water can be diverted directly from the channel of a stream or river.

Second, Where the supply is to be obtained from drainage,

which maintains a stream during part of the year, but which stream fails during the summer months.

Third, Where there are grounds affording a favourable situation for the construction of a reservoir, but through which there is no natural stream of water passing.

To obtain a supply in the manner of the first scheme, it is only necessary to have a weir or dam-dyke formed across the bed of the river, sufficient for diverting the water to the sluices placed above it, to admit and regulate the required quantity into the lead.

The form and construction of these dam-dykes must in a great measure depend upon the description of the stream in which they are placed. If it be deep, and the water of slow motion, and if there be an ample breadth of channel for the ordinary discharge, and not liable to occasional torrents; a fence of either stone or timber, formed obliquely across the river, from bank to bank, to divide the force of the current, may under such circumstances be sufficient, as in Fig. 4., Plate VIII

If, on the contrary, the stream be rapid, and liable to torrents in winter, the dyke must be built in a stronger style, and of a more substantial form. In order that it may withstand the impetuosity of these floods, it should be composed entirely of stone, and laid across the stream in the form of an arch, opposed to the current, and having its abutments bearing against the banks on each side, as in Fig. 5.

In the first description of dam-dyke, various modes of construction may be adopted to suit the stream.

In small streams, it may be sufficient to fix posts of from five to six inches in diameter across the bed of the stream in the direction of the dyke, at distances of from five to six feet apart, facing up the side opposed to the current, with rough plank-ing from two to two and a half inches thick, and close laid; then backing up this woodwork with rough dry rubble ~~stone~~ masonry, sloping at an angle of not less than 45°, the face being formed of stones set in edge, and close laid, the larger the

the better the stones employed in this rubble facing. The foundations of the whole work should be placed at least two feet below the natural bed of the water. This description of dyke should only be constructed on small streams, see Fig. 6, where *a a* are plank lining; *b*, upright posts; *c*, longitudinal beam fastened along the top of the posts; *d*, rubble backing; *e*, close set pitching; *f*, large loose stones; *g g*, natural surface of the ground, or bed of the stream.

The second mode by which a supply of water can be secured may now be noticed. This scheme, as before stated, is to obtain it from drainage, which maintains a stream during part of the year.

In every scheme for supplying water from drainage-grounds, it is necessary, in order to its arrangement and working, to ascertain as nearly as possible the quantity of water which the grounds may produce.

It has been found, from a variety of extensive experiments on this subject, that the product varies from four-tenths to seven-tenths of the quantity of water which falls, the proportion varying according to the description of the drainage-ground, and may be thus classed by the agriculturist in arranging his scheme.

If the drainage-grounds consist of flat arable land, then the quantity of water which runs off may be assumed, at from four-tenths to five-tenths of the quantity which falls, as indicated by rain-gauges. If the district consists of steep undulating arable land, then from five-tenths to six-tenths may be taken; and if the surface is lying in grass, the proportion will vary from five-tenths to seven-tenths according to the nature of the grounds,—such as steepness, hardness, cleanness of the sole, and the freedom of passage afforded to the water from flat grounds.

There are few estates in Scotland without a portion of high pasture lands or moor attached to them. It may therefore be a matter for consideration, whether it might not be

preferable to provide a general supply for the whole estate by reservoirs situated on the lands, rather than have recourse to particular supplies for each farm. Sites for reservoirs are generally much easier obtained in hilly districts than in low arable grounds. The cost of their formation will therefore be less; the price of the ground occupied by them will be cheaper; and by being placed away from the arable lands, no injurious effects to the crops will be experienced from their formation; and as it is an easy matter to conduct water by drains to any place from a higher level, every farm on the estate might be benefited by a reservoir constructed on the higher lands.

It has already been observed, that the first point to be fixed is the quantity of water required. Let it be supposed, that in order to maintain a constant stream through the fields of the farm, sufficient to generate the necessary mill power, and for domestic and other purposes, that a steady supply of thirty cubic feet per minute has to be provided. This would require a total quantity during twelve months, of about nine millions of cubic feet (9,000,000).

Now, to procure that water from land over which a depth of thirty inches of rain falls, and of which eighteen inches would pass off, it would only be requisite to have a drainage surface of 138 acres to secure the supply; care being taken, that the whole water passing from that surface joined the stream, which it maintains, at a point above the site for the regulating reservoir.

It has been ascertained from experience, and now generally adopted, that for grounds not situated in flood districts, that is, where the great portion of the water falls during one or two months of the year, the construction of reservoirs, capable of containing about five months' supply, are sufficient for maintaining a steady discharge, or regular meting out of the water produced from the whole surface during the year. In

the present instance, for the purpose of obtaining a steady discharge of thirty cubic feet per minute during the whole year, a reservoir would require to be formed on the stream, capable of containing five-twelfths of the supply, that is, five-twelfths of 9,000,000, or 3,750,000 cubic feet. To contain this quantity of water, a reservoir would be required, covering about eight and a half acres, and having an average depth of about ten feet.

Although it be necessary to form a dam of the capacity of three and a half millions cubic feet, to *secure* a regular discharge of nine millions from drainage, one of that size would be sufficient to *regulate* a supply of triple the extent, if the drainage-grounds were proportionably large, and productive. In such a case it would be frequently emptied and filled in the course of the year, and act as an auxiliary to the stream, getting replenished by every flood that might occur. In like manner, when the extent of drainage is large in proportion to the supply, the reservoir required to *secure* and regulate that supply may be proportionably small; and this diminishing proportion is maintained, till the supply be abstracted direct from the stream, produced from a drainage, which is capable at all times of furnishing the requisite quantity, in which case, a dam is unnecessary for penning the water, and is only required in conjunction with the sluices to regulate the quantity withdrawn.

In choosing a site for a reservoir, particularly when the supply is intended for mill-power, the lowest situation suited for such a purpose should be chosen, as there will then not only be obtained the command of a greater extent of drainage-ground, and consequently a smaller dam; but the farther advantage will be gained, of having a short lead from the dam to the mill,—an object of considerable importance.

Where possible to be obtained, it is always advisable to have the site of the dam on a retentive subsoil. The site should be chosen at or near the gullet of the natural basin,

and a very careful inspection made of the strata on which it is to be formed. If the stratum next under the surface-soil be stiff and retentive, then the dyke may with safety be founded by merely tiring the surface, but if the subsoil should consist of loose gravel, or porous rock, then it will be necessary to clear it out for a proper foundation for the embankment.

If the reach of the reservoir be short, and the necessary height of the dyke not more than fifteen or twenty feet, and stones easily procured, then it may be preferable to form it of a facing of masonry, backed up by earth-work, which may prove the most substantial, efficient, and cheapest of all dykes for a reservoir. If, however, the depth of the dyke is necessarily great, as well as of considerable extent, and a considerable reach in the reservoir, and consequently a violent washing from the waves, then it will be requisite to have a dyke formed of a mass of earth, and secured by masonry on the outside.

Suppose that a dyke of the first description will suit the situation. Then the foundation for the masonry should be cleared out for the whole length and of the necessary breadth. If this foundation be of clay, or of other retentive matter, the superstructure should at once be placed on it; the first layer of which should consist of concrete, placed in the clay, in two equal compartments, with an intervening dyke of equal breadth, as in Fig. 7, Plate VIII. This concrete bed should be formed with care; over it the masonry should be laid, and, if the waters of the dam are not liable to much agitation, a good facing of square jointed rubble work, set with proper mortar, and carefully pointed, will be sufficient. These walls should be four feet broad at the top, and rise two feet at least above the surface of highest water, and should slope or batter on each face twelve inches for every eight feet of height. The masonry of this wall should be solid throughout, well bonded, and carefully bedded in mortar, and the stones used should be of a sound and durable quality. If, however,

the foundation on which the wall is to be placed consists of gravel, or other porous or rocky material, then greater precautions must be observed, as in Fig. 8.

In such a case, a puddle-dyke must be carried from the masonry above the surface, and of a sufficient depth below the base of the concrete, as will prevent percolation. This dyke should be at least eighteen inches wide, and firmly kneaded into the trench made for its reception. If the foundation should be on rock, a sufficient bed should be cleared out for the concrete, and clay-puddle laid along the surface for a few feet from the wall, as in Fig. 9. The form of the wall should be that of an arch, and of about sixteen or eighteen feet high, (to which height a dyke of this description should be limited, unless of short extent), and it will be necessary to construct counterforts at regular intervals, in order to bind it to the earth-work, and otherways strengthen it. The versed sine of the curve should not exceed one-twelfth of the length of the chord of the arch.

In the centre of these walls, or at the deepest part of the dam, and from one to three feet from its bottom, as circumstances require, an opening must be left for a tunnel to pass the water from the dam. The size of such opening must be regulated by the quantity of water to be passed, but may be formed of eighteen inches diameter for all mill powers required for agricultural purposes. It is customary to form these tunnels of stone, throughout the whole breadth of the dyke, but a preferable plan has been adopted of placing an iron pipe, bedded in puddle. This iron pipe should reach quite through the masonry, and on the end of it should be placed the regulating or hand sluice for passing the water from the reservoir. The stones of this circular opening in the face of the wall should fit close to the pipe, for the first twelve inches from the outside, and its flanches should be tightly screwed to the face of the masonry. For the other portion of the wall the opening should be square, and at least

eight inches clear of the pipe on each side, to receive the puddle. The earth used in backing up this wall should be placed in horizontal layers, not more than twelve inches thick ; each layer being closely and firmly pounded together by heavy mallets. The bank should have an outside slope of about $1\frac{1}{2}$ to 1, and the surface soiled and sown down with whin and broom seeds. A side channel or waster must be formed, having its sill about two feet below the top of the dyke, for the purpose of passing any flood water that may enter the dam. This waster may be placed in different situations ; and may be accomplished by the sluices. If the ground on either side of the dam will answer for forming a byewash, then it may be easily constructed in that position, it being observed that the sectional area should be of sufficient size to pass the greatest flood that may occur in the natural course of the stream, and that the bottom be pitched with stones set on edge about twelve inches deep, and the whole grouted ; and the sides built with substantial walls, so as to prevent all possibility of accident to the dyke or embankment, by its flooding or bursting, and thereby falling on the back slope. A very secure waster can be formed by having the opening placed over the middle of the embankment, or near it, and conveying the water over the tail-slope in troughs resting on a gangway, allowing it to fall therefrom into the old water-course, tail-race or basin, as the case may be.

In the case of forming a reservoir with an embankment of earth, the same observations apply as have been made in regard to situation, foundations, &c. in the preceding case. Before the earth-work is commenced, the requisite masonry for the tunnel and sluices should be completed on the lowest ground. As in all reservoirs receiving flood and surface waters, a considerable deposit must take place of the matter mechanically suspended in it, it is necessary, as has been observed, to place the sluice some feet above the lowest ground or sill of the dam for the purpose of obtaining a silting bed.

The whole soil should be tilled from the ground to be covered by the embankment, and a layer of well pounded puddle, laid over the whole; along the whole of the tail of the slope, and in conjunction with this layer, a puddle-dyke should be carried down into the substrata, to a sufficient depth to prevent percolation beneath the embankment. The embankment should then be made up in layers not more than twelve inches thick, the whole being carefully consolidated and pounded, so that the bank may become one solid mass of material, or in fact a puddle-bank throughout. Particular attention should also be directed in forming these banks to exclude all large stones, or vegetable matter of every description, such as grass, roots, wood, &c. which by decomposing would have the effect of loosening the embankment. The inside, or slope towards the water, should have an inclination of three horizontal to one perpendicular; and the back or outside, a slope of two horizontal to one perpendicular; the breadth at the top should be from four to six feet, according to the size of the embankment.

When the earth-work has been properly finished, the embankment should be allowed to remain in that state for some months for the purpose of farther consolidation or settling down. After a sufficient time has been allowed for this purpose, the finishing should be proceeded with. This should be done in nearly the same manner as has been described for one of the river dykes, viz. a coating of broken stones should be laid over the whole of the inside slope to the depth of twelve inches. These stones should be closely beat together. Over this coating the whole slope should be pitched with good stones, closely laid, averaging from ten to eighteen inches deep, according to the stretch of the surface of the dam, and the strength of the surge which may be expected; or if the waves be anticipated to wash with much force against the bank, it might be well worth the additional cost of grouting the whole surface. This pitching should be continued over the top of

the embankment, and if the material of which the embankment is formed should consist of loam, or any rich alluvial soil, or such as water-rats or moles would be induced to penetrate into, then the coating of broken stones should also be laid over the back slope, and carried down into the subsoil as far as the first layer of puddle. This, if well executed, will prove a preventative to the inroads of vermin.

In the third case by which a supply of water can be secured. It may be accomplished by running out *catch-drains* from either end of an embankment above the level of the surface of the dam, so as to intercept the water gathered from drainage lying beyond the ridge of the basin in which the dam is situated.

It will readily be perceived, that in obtaining a supply of water by this mode, the reservoirs require to be formed of a larger size, in proportion to the extent of the supply than in the preceding case: for instance, if the floods should continue only two months of the year, then the reservoir must have a capacity equal to ten-twelfths of the year's supply, or, in short, they must contain at least a quantity of water equal to the supply required during the whole dry period.

The construction of reservoirs for this scheme is similar to those just described.

The following memoranda regarding the nature of various substances which are employed in embanking for reservoirs of water, as well as rules in relation to particular states of water may be useful to the agriculturist.

Grout is a thin description of mortar, and sufficiently fluid to run into the irregular spaces between the stones in rough facings. It should be made of mortar which has been well beaten in the making, and kept at least twelve months, in which case it will set in a few days—when made of new mortar it may never harden.

Concrete, or artificial stone, is formed by mixing coarse and fine gravel with about a sixth or eighth part of slaked lime and water laid in regular layers of six inches in thickness, each layer being grouted and immediately hard ram-

med down; in this manner a solid mass of material of any extent may be obtained. Concrete is well adapted for foundations or underbuilding, or for filling or backing up where solidity is required.

Sheet-piling is formed by driving flat stakes into the ground having their edges placed close together, and which should be from eight to twelve inches broad. Beech-wood is well calculated for this purpose, where it will always be under water. The piles may require to be shod at the point, and have a ferule at the top to prevent them from splitting when in the course of being driven.

Puddles used in water-works should be entirely formed of clay. The clay should be taken from some under stratum, free from all vegetable substance and insects; by using it of this description it will not be liable to be perforated by moles or water-rats. When taken from the pit, the clay should be cut up in small pieces by a spade, and moistened with water. It should then be beaten and incorporated with a spatula, till the whole becomes of a regular and soft consistency, and such as a man would sink into by treading on. This material should be laid down in layers by beating and pounding.

Motion of Fluids.—Suppose it were required to ascertain the quantity of water flowing in a stream, the *velocity* of the water is greatest at the surface, and at the middle of the stream, from which it lessens towards the sides and bottom, where the friction retards it. The surface-velocity may be found by noting the distance a body, such as a piece of cork, will pass over in a given time, say one minute; extract the square root of this, and deduct that root from the surface-velocity and add $\frac{1}{2}$ or .5, which will give the mean velocity per minute, thus: suppose the surface-velocity to be 81 feet per minute, the square root of that is 9 which deducted from 81 leaves 72, to which add .5, making the mean velocity of the stream, or that which would produce the same discharge if the stream were equalised, to be $72\frac{1}{2}$ feet per minute.

The discharge of water from sluices, may be ascertained

thus:—Suppose a sluice to be placed in a dam having its opening 9 feet below the top of the water, and the size of the opening 4 feet wide by 2 feet deep; the water which would be discharged by it would be found by taking the square root of the depth in feet and multiplying it by 5.4, which will give the velocity in feet per second; and which multiplied by the area of the orifice in feet, will give the number of cubic feet discharged per second, thus: the square root of 9 is 3, which \times by 5.4 is, 16.2 feet, being the velocity per second, then 16.2×8 square feet being the area of opening is 129.6 cubic feet discharged per second; or if the area of the orifice should be large in proportion to the depth, take the medium depth, and two-thirds of the velocity ascertained from that depth as the true velocity per second. The quantity of water run over a notch gap cut into the side of a still water dam, open above, may be or found thus:—The velocity at the bottom is found as in the last example, which \times by the depth, and taking two-thirds of the product as the area of the parabolic section, and this \times by the breadth of the gap, will give the cubic feet discharged per second. Suppose the depth to be 4 inches, and the breadth 6 inches; then 4 inches = .3333 of a foot and $6 = .5 \sqrt{.3333}$, $= .5772 \times 5.4 \times 2.3ds = 3.1168 \times .3333 = 1.0388 \times .5 = .5194$ cubic feet per second, or $.5194 \times 60 = 31.164$ cubic feet per minute.*

Power of a stream of water.—What is the power of a stream, 4 feet wide, 12 inches deep, having a mean velocity of 60 feet per minute, and a fall of 15 feet? The quantity of water discharged per minute is $4 \times 1 \times 60 = 240$ cubic feet; 240 cubic feet $\times 62\frac{1}{2}$ lb. the weight of a cubic foot of water is 15,000lb. which \times by the height of the fall, 15 feet, gives the momentum = 225,000 lb. — this divided by 32,000 lb. which is a horse power according to Watt, gives 7 horses power, as the power of the stream. This is the power by calculation, but the effective power will only be 4.8 horses.

* For the velocities, power, &c. of effluent and falling water, see Bank's Treatise on Mills. —Ed.

PROGRESS OF THE MANUFACTURE OF PEAT-FUEL.

[The following letter from Mr Slight, Curator of Models and Machines in the Museum of the Highland and Agricultural Society of Scotland, to Sir Charles Gordon, Secretary to the Society, was written in reply to an application from Sir Charles, in behalf of a friend who wished to have the best information on the progress of the preparation of peat-fuel. Applications for information on this subject having of late become very numerous, this communication, which forms an answer to all inquiries of the same kind, is now published with a view to disseminate the present state of knowledge in this branch of useful industry, a branch which has been viewed with much interest, not only in this country, but in many parts of Continental Europe.]

EDINBURGH, Feb. 17. 1838.

SIR,—I have received your letter, inclosing that of Mr R., and have much pleasure in complying with his inquiries respecting “ Lord Willoughby de Eresby’s Peat-compressor,” and also for “ authentic information on which foreigners might rely, regarding the progress of the preparation of peat-fuel by machinery.” From the numerous applications for information on this subject, you are well aware of the importance it has assumed, and also that much misapprehension exists as to the precise value of all that has been done in the matter. I conceive, therefore, that the best service I can render to you and to Mr R., as well as to his friends in Germany, is to give a detailed statement of at least the leading points of the various trials and experiments that, to my knowledge, have been conducted during the last six years in this important subject; you will pardon me, therefore, if I should appear more diffuse than the case might be supposed to require.

In 1832, in compliance with a proffered premium from the

Highland Society of Scotland, for the best essay, with detailed experiments, on the preparation of peat-fuel by compression, several essays were presented, among the writers of which Mr Tod was the successful candidate. Mr Tod's paper bore every appearance of having been compiled with care, and the experiments of having been conducted with accuracy. A high degree of confidence in his results was therefore induced. The essay, with a figure of the simple lever-machine used by him, was published in No. 19. of the Journal of Agriculture and Transactions of the Highland Society, being vol. ix. p. 373 of the latter. So much was I impressed with the result of the experiments, and the great utility of the discovery, that I appended a note to Mr Tod's paper, expressive of my conviction of the great advantages to be derived from it. In a subsequent number of vol. x. p. 111, of the Transactions, I gave a separate paper on a compound lever machine, which was then thought might be more extensively useful than the simple machine proposed by Mr Tod. I had also, in the interim, made a considerable number of simple lever machines, and others of combined mechanical powers, but, without an exception, all these machines failed to produce the results communicated by Mr Tod. This failure did not arise from want of power to produce compression, but from the *time* absorbed in performing the different manipulations required in the process. In the course of oft-repeated trials, it was observed that, owing to the tenacity with which the peat-moss retains its moisture, it became necessary, for the expulsion of this moisture, to subject that substance to very great and continued pressure, which tended still further to increase the *expense* of compression. The machines here alluded to having been constructed to press only a small surface (from half a square foot to one foot), it became apparent that, by pressing a more extended surface at one operation, and with several machines going on in succession, not only greater time might be afforded for expelling the moisture, but a *greater*

quantity of peat might be prepared. Even with this arrangement the process was still too expensive in regard to time. A difficulty also, not yet noticed, had attracted attention ; this was the extreme tendency of the soft moss to escape during the pressure, through the small perforations purposely formed in the receiving boxes for the escape of the expressed water. It was soon found that the most minute perforations, either in metallic or wooden plates, would not retain the soft moss, and the only security against its escape was the application of an envelope of coarse linen or of woollen cloth, as is practised in the expression of vegetable oils. This envelope, besides its own cost, formed another obstacle to expedition in the process.

The hydraulic press, the use of which had been suggested in one of the papers alluded to, now became a resource from which relief from some of the difficulties might be expected ; and as observation had also shewn that a decided improvement in the quality of peat was produced, especially in the brown and fibrous kinds of moss, by subjecting them to trituration, it was conceived that a combination of the hydraulic press with previous trituration would, in a great measure, overcome all the former obstacles. Under these impressions, several respectable individuals formed themselves into a copartnery, and erected the requisite machinery to constitute a regular manufactory of peat-fuel. Their machinery consisted of a four-horse power steam-engine, four hydraulic presses of 6 inch cylinders, with proper receiving boxes, each capable of pressing three cakes of peat, two feet square and three inches thick, at one operation ; also, a pair of heavy edge rollers and pan, to triturate the moss previous to the compression. The presses and rollers were worked by the steam-engine. This establishment, which bore great promise of success, had only performed a few experimental trials, when the copartnery was dissolved, and the machinery disposed of. In this instance the locality was ill chosen, being distant from market sixteen miles

of land-carriage. Had the locality been favourable, there appears no reason to doubt that the speculation might have been successful. The few experiments made at this establishment confirmed the expectations of all as regarded the good effects of trituration; and it also confirmed observations made in trials of compression, that, however much, moss might be pressed, it could not be reduced thereby to its minimum bulk. It has been satisfactorily ascertained, that after the greatest pressure that could practically be given to moss, the peat, on exposure to air and heat, goes on contracting till it loses about one-third of its compressed bulk, and in some cases more than this, varying in this respect with the quality of the moss; so that one of the advantages expected from compression (reduction in bulk), has not been realised. It is now presumed, and that on good grounds, that, taking equal bulks of the same quality of moss, the one being subjected to compression, the other left to dry in air, their ultimate bulks will be equal.

In this stage of the experiments, those taking an interest in the subject began to think that pressure might be altogether dispensed with, and the process attempted by simple drainage and trituration. A gentleman, Mr Linning, who had long given his attention to the subject, accordingly established a manufacture of peat-fuel on this principle, which was in operation during the summer of 1837, in Gaunkirk Moss, near Glasgow.

The practice adopted by Mr Linning, for which he obtained a patent, is as follows:—The field of moss intended to be acted upon for the season is drained as much as possible by running ditches through it, to draw off the surplus water. A pug-mill (the common brick clay-mill) is erected close to the scene of operation: the mill is worked by a horse or other power. The moss as it is cut by a common spade, is thrown into the mill, and after passing through it, is removed in wheel-barrows to the next operation. This consists in filling wooden moulds with the triturated moss pre-

cisely in the manner of brick-making. From the moulding-table, the new-formed peats are carried by boys, and laid out on the surface of the moor, to consolidate. In two or three days they can be handled, and are then carried to a shed, where they are spread out on shelves to dry, or to a drying-house, artificially heated by means of flues, which are ramified all over the sole of the drying-house, and heated with peat-fuel. In a few days more the peats are ready for use.

The processes here are very simple, and the expense of machinery but trifling. The mill, which is the principal article, may cost about £20. I am not certain of the quantity it will produce per day, but think it will be about four tons of peat when dried. The pug-mill is perhaps not the best that might be devised for the purpose, but it answers the end, and is cheap.

I had an opportunity last summer of seeing the whole process in operation: it was then in its infancy, and I cannot with certainty speak of its results, but, from former experience and calculation, I estimate the cost of production of the fuel at about 5s. per ton. I can speak with confidence of two trials having been made with this prepared fuel, in the furnace of a locomotive engine, with its train, on the Glasgow and Garnkirk Railway. The distance travelled was eight miles; and the consumpt of peat on the whole journey was just double the weight of coal required to fire the same engine over the same distance. The engineer was of opinion that if the furnace had been properly adapted for peat-fuel, three-fourths the quantity would have sufficed. The engine travelled at a speed somewhat higher than its ordinary rate with coal-fuel. This trial of the locomotive engine seems to be a point gained of some importance, since it goes to establish a much higher value to peat-fuel in producing heat than has been given to it by any writer on the subject (Mr Tod excepted). Here we have it under a great disadvantage, as compared with coal, heating in the proportion of *one to two*, while

the latest writer on the subject, Dr Arnott,* gives it as nineteen to ninety, or nearly *one* to *five*. The prepared peat used in this experiment was originally of a fibrous brown quality, but by the process had become of a compact texture, and blackish-brown colour, probably not quite equal in heating power to the very best naturally black peat.

While experiments have been going on in different quarters, Lord Willoughby de Eresby has been indefatigable in his exertions to promote this improvement in the fuel of a large portion of the population of Scotland. His Lordship has succeeded in bringing into operation a very ingenious machine for the compression of peat-moss for fuel, but owing to its construction, it must be always expensive—producing only one peat at a time, and rendering the use of the cloth envelope indispensable; on the whole, though I am satisfied of its producing peats of good quality, I am yet uncertain as to the expense at which it will produce them, and have considerable doubts as to the capabilities it may possess of supplying a very large demand, but not having seen it in full operation, my opinion of it must be given with diffidence.

From all that has been stated, you will perceive that we are yet without any *single machine* by which the preparation of peat-fuel can be economically produced in a satisfactory manner, and you will also perceive that, after six years' experience, with some observation, and more of study on the subject, I incline to give a preference to that mode which dispenses nearly altogether with compression, and which depends on trituration for the improvement of the fuel.

The result of all my observation on this subject may be summed up in the five following points:—1st, That peat-moss in which the vegetable structure is entirely or nearly decomposed, or that which is usually called black moss, is improved little or none as a fuel by either compression or trituration, nor can its *ultimate* bulk be sensibly reduced by any practicable degree of compression.

* Arnott on Warming and Ventilating.

2d, That brown fibrous moss is very much improved as a fuel by trituration, probably arising from some chemical action between its exposed fibres and the atmospheric air, but in whatever way, a more compact and carbonaceous texture is produced; but that while subsequent pressure may draw off part of its water, it will neither materially improve its quality as a fuel, nor sensibly reduce its ultimate bulk.

3d, That very fibrous moss may be reduced in bulk to a small extent, will be sooner dried, and partially improved, by simple compression.

4th, That there is no decidedly approved machine at present in use that will by one operation produce the greatest possible improvement in the quality of peat-fuel, either on a large or small scale.

5th, That since compression cannot be conducted by any means with which we are yet acquainted, without an envelope of cloth during the act of compressing, to prevent the escape of the moss, we cannot expect to exercise that agency with advantage until this bar be removed.

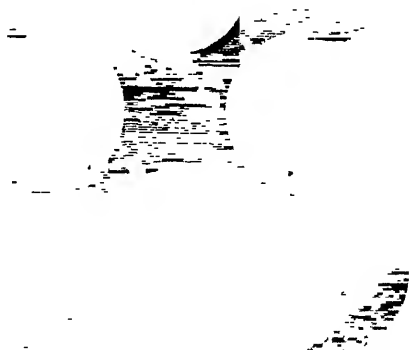
I have the honour to be, Sir, your obedient Servant,
JAMES SLIGHT.

ON IMPROVED SHEEP-STELLS. *By Dr JAMES HOWISON,
Crossburn House, Douglas.*

THOUGH sheep farming in Scotland has now become an object of national importance, yet from my observation and experience, it is still greatly deficient in affording the necessary shelter which in our high latitudes these useful animals require. About thirty years ago, with the view, in some measure, to remedy this evil, I built two sheep-stells, described below, Nos. 1 and 2, on a new plan, upon a farm belonging to me in the parish of Robertson, in the Upper Ward of Lanarkshire, the utility of which has met the approbation of all the

sheep farmers in this part of the country. From a wish that the construction of these useful receptacles for stock may be still more improved and more generally known, I add the description of a third, which, although not yet carried into practice, I consider to be a great improvement on Nos. 1 and 2, as containing in itself all their useful properties, with others they do not possess. Any one of the three is preferable to the naked circular wall, the only stell made use of in this part of the country, until those erected by me.

No. 1.



Stell, No. 1. This stell is calculated to afford shelter at all times of the year, the four projecting circles forming the same number of recesses, and suffering the wind to blow from any of the points of E., W., N., or S.; two of the recesses give complete shelter; and if from any of the intermediate points, three of the recesses afford shelter. It must be kept in mind, that as many years must expire before the trees can add much to the shelter, the walls of the stells should never be less than six feet in height, and if a foot more, both trees and sheep would reap an advantage, much greater than any saving from the difference in the additional building. The size of the

stell must be regulated by the number of sheep, but the belts of planting must never in any part be so narrow, as that when the trees are grown up the wind can make its way through them. Indeed, were it not from motives of economy, I know no other circumstance that should set bounds to the size of the stells, as a small addition of wall adds so greatly to the number of the trees, that they become the more valuable as a plantation, and the droppings of the sheep or cattle increase the value of the pasture to a considerable distance around in a tenfold degree.

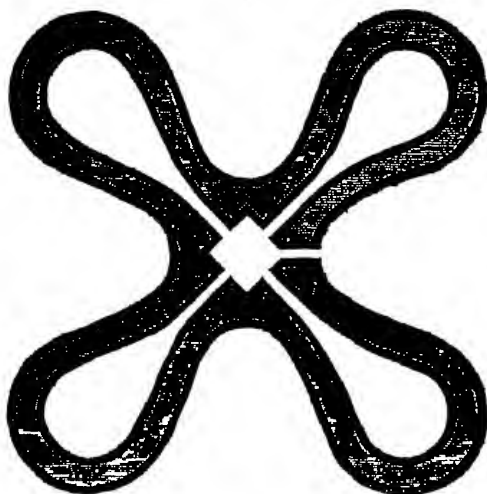
No. 2.

Stell, No. 2. This I consider as the winter stell, and is kept shut during summer, as the hay is here stored for feeding during the winter storms; and from its circular form, can afford but little shelter, until the trees by which it is surrounded grow up.

Stell, No. 3. This stell, although not yet put in practice, from its being capable of answering all the good purposes of the other two (of these we have had ample proof), gives me reason to think, that, in the additional objects contemplated, it will be equally successful. Besides giving the same shelter outwardly as No. 1, and better inwardly than No. 2, with re-

gard to the convenience of stowing hay for winter use near the stock, I consider the leaving of the centres of the circles open as a great improvement, on account of the additional

No.3.



room gained, and where the shelter must be complete. Should plantations of considerable extent be made, it would then be necessary, instead of one opening into the centre, to have one from the bottom of each recess.

Where gentlemen wish to embellish their estates with plantations, the advantage which the form of No. 3 has over squares, circles, and belts, in producing picturesque effect is obvious. In my opinion, however, were the beauty of its form to be set aside altogether, the great advantage, as to shelter for sheep or cattle, which this mode of enclosing plantations has over any other, should induce landlords to adopt it, and assist their tenants in exposed situations to erect stells, similar to it, always keeping in view, that by so doing, the advantage to the tenant is great, as soon as the wall is built, and that eventually the land lost will be amply compensated by the additional value to his estate from the plantations. There are few sheep farms in Scotland, where on one part or another

convenient for the erection of stells, stones are not to be found. By some it has been objected that shelter is apt to make sheep lazy and unwilling to work amongst the snow to reach their food. My tenant, Mr Wilson, however, informs me, that he has ample experience to the contrary, as he has always found that the sheep when well sheltered during the night are much more able and willing to work during the day, than those which had been exposed to the storm ; and that in the season of 1837, from the trees in Nos. 1 and 2 being of a size to be uninjured by the sheep taking shelter among them, his loss may be said to have been nothing when compared with that on the surrounding farms.

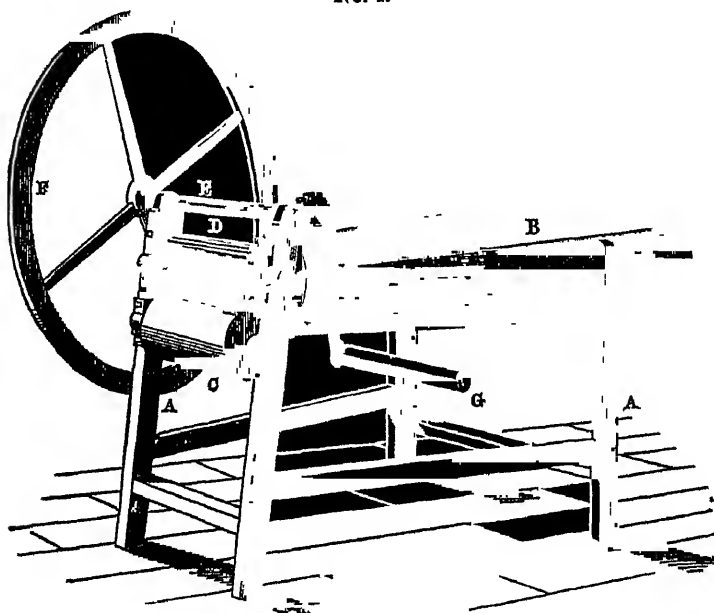
CANADIAN STRAW AND HAY CHOPPER.

AMONGST other interesting information that has been, from time to time, received through the indefatigable exertions of Mr Fergusson of Woodhill, an ex-director of the Highland and Agricultural Society, we have to give the following concise description of a new and very efficient straw-cutter, communicated by him in a private letter to the Secretary Sir Charles Gordon. Mr Fergusson, after shortly referring to a sketch of the machine, concludes in these words—" It is quite new to me ; and further it is the easiest and most effective cutter I ever met with ; it is really a first-rate machine. An American claims the invention, and makes us pay L.7, 10s. currency for it, which is far too dear."

The communication having been laid before the committee on machinery, it was approved of, and ordered for publication ; but in order to prevent any mistake in its description, Mr Slight, Curator of the Society's Models, intimated his intention, by permission of the Committee, of having a working machine constructed from Mr Fergusson's description, previous to publication.

The machine having been completed and examined at work by several members of committee, it has been found to bear out all that was reported of it by Mr Fergusson,* with this additional and important advantage—that it can be well and substantially made, and sold at L.5, or probably under that price. Respecting the efficiency of this straw-cutter, it has been reported, and now ascertained, that it will cut three times more than the best of the common sort, and with less force. One person driving the machine will cut with ease five cwt. of hay or straw in an hour.

No. 1.

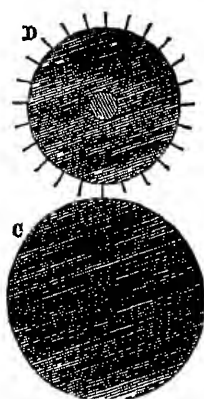


The annexed cut, No. 1, represents this very simple machine. AA is the wooden framing, and B the feeding trough, into which the straw is laid for being cut. The chief acting parts are the rollers C and D; the first a plain roller of hard wood, about six inches in diameter and eight inches in length,

* This new straw-cutter may be seen at the work of James Slight and Co., Panmure Place, or at their new establishment, Leith Walk, Edinburgh.

the second a metal roller of about four inches in diameter, set round with steel knives of one inch in breadth, thus making the entire diameter of the roller about six inches. The cutters are fixed upon the periphery of the roller and parallel to the axle. A spur wheel is mounted on the axle of the roller D, and a small pinion, mounted on the axle E, takes into the spur wheel, the same axle also carrying the fly-wheel F, and the handle G. The detached cut, No. 2, is a cross section of the two

No. 2.



rollers; C being the wooden roller, and D the cutting roller as before. When in operation, the wooden roller is kept in contact with the edges of the successive knives, and the effect produced is, that straw laid into the trough is drawn forward by the *bite* of the cutting roller against the surface of the plain one, the latter acquiring its motion simply by reason of its contact with the other, and as the straw advances, it is cut through when the edges of the successive

knives arrive at the *line of centres*. The length to which the straw is cut will always be proportioned to the number of knives; in the present case the number of knives being twenty-four, the length of cut is about three quarters of an inch. A striking peculiarity presents itself when this machine is seen in the act of cutting; in the common machine the cut straw falls from the knives in detached parcels, in this it seems to flow from them in one unbroken stream.

ON THE PLANTING AND STORING OF POTATOES. *By the
Rev. Dr SINGER, Kirkpatrick-Juxta.*

As the result of experience, I may mention, that the best mode of *planting* potatoes is to plant them all *whole*, not of the largest nor the smallest size, but of the middling dimensions. A field of four acres planted in this manner in 1836, the potatoes placed about ten inches asunder, proved a full and good crop. The cutting of the sets exposes to the loss of juice and substance, and also to the attacks of insects and other accidents; the keeping of cut seed-potatoes in heaps for days, or even weeks, also contributes to engendering disease.

Potatoes should always be taken up in tolerably dry weather; and they should be laid on the surface of dry land, not sunk into any kind of pit. The heaps should be crowned up long and narrow, and covered with dry straw. The next operation is to dig all round, and lay on dry earth above the straw, in the form of a narrow roof, drawn to a ridge, duly clapped into shape by the spade, and made firm. In this way, the juices and quality of the tubers are not impaired till they begin to grow, or send forth stringy shoots, about April or May. They are then to be removed by carting, and laid down in any cool place, an outhouse or shed. This operation stops the growths; and by repeatedly turning the potatoes, new growth is prevented thereafter. In this way, the old potatoes may always be made to meet the new crop.

BARBERRY BUSHES IN HEDGE-ROWS CONSIDERED AS THE
 CAUSE OF RUST OR MILDEW ON CORN-CROPS *By the Rev.*
Dr SINGER, Kirkpatrick-Juxta.

A full statement of the ravages of this distemper on the crops of oats, in various parts of Dumfriesshire, was published in the Agricultural Survey of that country in 1812. On one farm alone, that of Kirkbank, on the estate of Annandale, Mr John Aiken, the respectable tenant, lost about L. 100 in his oat crops yearly, and altogether the damage in this county was, without doubt, considerably above L 1000 yearly. The views of Sir Joseph Banks, and of some intelligent practical farmers, relative to the evil influence of the *Berberis vulgaris*, induced the late Admiral Sir William Johnstone Hope to give orders for the total extirpation of the Barberry bushes which grew intermixed with thorns in the hedge-rows; and *since that was done, and for above twenty years, no such distemper has appeared in these fields.* The same thing has been done in some parts of Ayrshire, and the same result has followed. These facts are certain and highly valuable. They certainly indicate some connection between the occurrence of rust or mildew on growing corn, and the neighbourhood of barberry bushes. There is this difficulty, however, that botanists describe different minute fungi as prevailing on the respective plants. But even the genera of these minute fungi do not yet seem definitely settled, especially *Mucor*, *Uredo*, *Puccinea*, and perhaps *Æcidium*

ON THE CARBONIFEROUS FORMATION OF THE LOWER WARD
OF LANARKSHIRE. *By Mr JOHN CRAIG, Mineral Sur-
veyor, Glasgow.*

Preliminary Remarks.—Having paid considerable attention to the nature of the coal-formation of the Lower Ward of Lanarkshire for a number of years, I was encouraged by the premiums of the Highland Society of Scotland to devote my attention more exclusively to geological subjects, in the hope of being able to do something to promote the patriotic object of the Society, by obtaining correct and useful information respecting the mineral resources of the county. I proposed, therefore, to select a given portion of it, and report thereupon, but more extended observation shewed me the necessity of extending my survey beyond the limits I had contemplated. I became anxious to combine in one report something like a condensed, yet practical view of the different formations developed in the county from the old red sandstone upwards. In the course of my investigations I encountered considerable difficulties from the variation of the lines of stratification, and the causes of the variation being hid from view by the superincumbent alluvial deposits.

In treating of the different rocks according to their stratigraphical position and geographical distribution, the views given may not be satisfactory to some, nay, possibly, they may be incorrect, but I have been guided in my deductions by no wish to theorize.

In my journeys I was careful to make a complete collection of the rocks, erratic blocks, organic remains, and the series of specimens has been forwarded to the Society's Museum. I may now state how I conducted my observations. I first traversed the boundaries or out-croppings of the upper red sand-

stone, examined the channels of the streams where it is developed, visited the different quarries, and noted down every thing I considered worthy of observation. I then proceeded to trace, as accurately as the nature of the country would permit, the exterior boundaries of the upper coal series, indicated, particularly on the north, by the occurrence near the surface of a coarse grit, probably an equivalent to the millstone grit of the English coal-fields. I then visited all the limestone and coal works included in the range of my survey, and collected all the information I could obtain, verbally, or in writing, respecting the different beds of coal, limestone, and ironstone, and their associated layers; determining at all times from actual observation the level course and dip of the strata. My next, and not least arduous, task was to determine the northern limits of the old red sandstone. In my wanderings I had also the trap-rocks to attend to, and to ascertain whether they occur as dykes or overlying masses. To give any thing like an accurate map or sections, all these observations were necessary, and combined as they were with the tracing of faults, and the endeavouring to identify the respective beds of coal, ironstone, and limestone in different places through the wide range of so extensive a survey, it will readily appear I had imposed upon myself a task which, however indifferently it may have been executed, was by no means easy or unimportant. I cannot conclude these remarks without acknowledging the receipt of much kindness from the proprietors of the different works I visited, and it would be ingratitude in me not to allude particularly to the assistance I received in my labours from two gentlemen, namely, J. H. Colt, Esq. of Gartsherrie, and James Smith, Esq. of Jordanhill.

The carboniferous rocks of northern Lanarkshire may be thus subdivided :

1. The upper red sandstone series.
2. The upper or fresh-water coal series.
3. The lower coal and carboniferous limestone series.
4. The old red sandstone series.

The geographical distribution of the different series will be best understood by a reference to the map. It would therefore be a waste of words to endeavour to convey in writing what is so much more readily comprehended at a glance. I shall, therefore, proceed to a description of the different formations, commencing with the upper red sandstone.

1. *Upper Red Sandstone*.—The deposits constituting this series are conformable with the upper coal-beds to the north and east, but on the south and south-west there is reason to believe that they are unconformable with these beds. This is evident from the circumstance that none of the upper coals are found cropping out from Dychmont to Chapel near Eddlewood. A line drawn from the former to the latter place, marks the boundary of the formation in that direction. Beyond that line the strata are referable to the under coal or carboniferous limestone series.

In the bed of the Rotten Calder near Crossbasket House there is a great disruption of the strata. The disturbed beds consist of dark brown and reddish sandstone. Immediately beyond this fault, the beds consist of the limestones, shales, and ironstones peculiar to the lower portion of the under coal series. The same fault seems to pass eastward through Auchintiber, where the strata preserve the same anticlinal direction, and consist, on the one hand, of beds of red rock, and on the other of limestone, shale, and clay-ironstones. On the same line the red sandstone is seen terminating in a burn at Meickle Earnock at a fault which brings beds of sandstone, shale, &c. to the surface. A number of faults are

observable in ascending the stream ; the beds which they disclose seem to me to belong to the under-coal series. This is rendered more probable from the fact of limestone having been wrought in the adjacent lands. The beds of white sandstone and shale preserve the same dip as those of the red sandstone, for two or three hundred yards beyond it, where another fault occurs, and the beds, instead of dipping to the Clyde, dip to the south. These facts appear to justify the opinion that the same conformability to the coal-formation is not preserved by the red sandstone on the south and south-west as on the other limits of the series, and that, consequently, though it is associated with some thin seams of coal in the neighbourhood of Hamilton, it cannot properly be regarded as belonging to the coal-measures. The formation consists of two or more beds of red and variegated sandstones alternating with variegated shales and marls. These marls underlie a bed of red sandstone on the Avon between Barncluith and Cadzow Castle, and they are superimposed upon two thin seams of coal, varying from 1 foot to 18 inches thick each. Immediately below these coals there lies a bed of reddish-coloured rock 80 feet or 90 feet thick, which may be regarded as the lowest bed where the red colour predominates. In some places this bed passes into a white rock, and it is frequently variegated with stripes and spots of red or white. The sandstones and their accompanying shales are slightly calcareous, a circumstance to which probably the greater fertility of the district is owing.

In the sandstone beds masses of more indurated matter are frequently to be met with. They are more calcareous than their matrices, and seem to be of concretionary origin, like nodular ironstone, or nodules of flint in chalk.

The faults which disturb and dislocate the coal-beds are common to the upper red sandstone, particularly to the north. There is no instance of the formation having been penetrated by trap. The red sandstone, however, is seen with a high

angle of inclination resting on the igneous rocks of Dychmont Hill, a circumstance from which we must infer either the posterior origin of the greenstone of that district, or the subsequent gradual elevation of the range through the agency of internal consolidation. The connection of this greenstone with the trap of the parishes of Mairns, Eaglesham, Kilbride, &c., where the limestones and ironstone strata are disrupted and altered by its proximity, seem to me to be confirmatory of the latter view, and to date the origin of the trap at a time considerably anterior to the formation of the red sandstone.

2. *Upper Coal Series*.—This series consists in its upper and lower divisions of a great many beds of sandstone, shale, and fire-clay containing thin layers and nodules of ironstone, but no coal of any consequence. The workable coal beds and ironstones occupy the intermediate position. The total thickness of the formation cannot be less than 220 fathoms, allowing 50 fathoms from the red sandstone to the first workable coal, and 70 fathoms from the lowest workable coal to the first bed of carboniferous limestone. Any thing approaching to limestone in this formation can only be regarded as calcareous sandstone; nor, as far as my observation has gone, does it contain the slightest trace of marine organic remains, the shells found in it being all referable to the fresh-water genera *Modiola*, *Anodonta*, and *Unio*. The corallines and encrinites common to the under series are never found in it; nor, on the other hand, are the shells of the upper coal series ever found in any bed below the first or upper limestone of the lower coal series. It appears, therefore, that we are justified in dividing the coal strata of Lanarkshire into the fresh and salt water deposits. The other organic remains found in this series are immense quantities of fossil plants of the genera *Lepidodendron*, *Sigillaria*, *Stigmara*, *Calamites*, *Asterophyllites*, and the fern family, the most common of which are the *Pecopteris* and *Sphenopteris*,

and more rarely the *Neuropteris* and *Cyclopteris*. These occur in great abundance, with the dorsal spines of the *Gynacanthus formosus* of Agassiz, in the roof of the Splint coal at Chapelhall. Teeth of sauroid fishes have been found in the lower beds of the same series near Carluke, as also teeth approaching in size and character to those of the *Megalosaurus*.* These have been lately discovered by Dr Rankin of Carluke, and are now preserved in the Museum of the Andersonian University, Glasgow.

I shall now present the reader with a short description of the coal-seams which are thick enough to be workable. These are known by different names in different places, and vary in thickness and quality in almost every locality, as a reference to the sections in the appendix will shew.

1st, The upper coal,—a thin seam that thickens out in only one or two instances to be workable. In Millfaulds' pit, near Coatbridge, it is the fourth seam found, and is 2 feet 3 inches thick, and lies about 33 fathoms from the surface, or about 24 fathoms from the alluvial covering. It occurs about 15 fathoms above the Ell coal. At Cuilhill, it is 2 feet 6 inches thick, and lies about 16 fathoms above the Ell coal.

2d, The Ell coal of the Monklands, and the Mossdale or upper coal of the Glasgow field. This coal at Glasgow measures from 3 feet to 4 feet in thickness. In Old Monkland it is thinner, and seldom wrought; but at Chapelhall and Airdrie it is esteemed an excellent coal. At Quarter, near Hamilton, Dalserf, Motherwell, and Coltness, it is found from 6 feet to 14 feet in thickness.

3d, The Pyot Shaw coal of the Monkland, and the Rough Ell coal of the Govan collieries, is from 3 feet to 5 feet thick and lies from 7 fathoms to 10 fathoms below the Ell coal.

4th, The Main coal is sometimes connected with the Pyot Shaw, in which case it forms a 9-foot coal. This is the case at Drumpellier, Chapelhall, Newarthill, and Ballochnie col-

* *Megalichthys* ? EDIN

lieries. The distance, when these two seams are separated, varies from a few inches to 7 fathoms.

5th, The Humph coal is seldom thick enough to be workable. It is thickest in the neighbourhood of Glasgow, where it measures somewhere about $2\frac{1}{2}$ feet thick.

6th, The Splint coal is the most esteemed of all the coals, for the purposes of manufacture. Near Glasgow, it measures from 2 feet 9 inches to 4 feet thick; but at Larkhall it is about 5 feet in thickness, and contains a few inches of Cannel coal. The distance of the Splint from the Humph coal is generally about 4 fathoms. Its distance from the Main coal varies from 10 fathoms to 14 fathoms.

7th, The Virtuewell coal, or Shotts Laigh coal, occurs generally about 27 fathoms below the Splint coal. It measures $2\frac{1}{2}$ feet to 4 feet in thickness.

At Govan colliery, the intervening strata seem to be wanting, and the two under coals are brought together, forming, within a foot or two of the real Splint coal, a coal 7 feet 6 inches thick, including the parting of stone. With respect to the identity of the Virtuewell and Kiltongue coal, and the Main Splint of the Govan collieries, I speak with hesitation.

8th, The Kiltongue coal is the next in the series, and lies about 22 fathoms below the Virtuewell coal. It sometimes contains a few inches of gas coal. In the neighbourhood of Larkhall it is highly bituminous, and very profitable. It measures from 2 feet to 4 feet in thickness.

9th, The next and last workable coal is a seam called the Drumgray coal. It is seldom more than 18 inches thick, and lies about 6 fathoms below the Kiltongue coal.

There are twenty-five thin seams besides those I have enumerated found in the different sections of the upper coal series; but none of them are thicker than 14 inches.

I have thus enumerated the workable beds of coal which belong to the upper portion of the coal-formation of Lanark-

shire. Stretching, as they do, over a large area, and associated as they are with ironstones of great value, the possession of such mineral treasures in the west of Scotland cannot but be regarded with feelings of satisfaction by the lover of his country.

Ironstones.—The principal ironstones of the upper coal series are,

1. The Upper Black Band.
2. Mushet's Black Band.
3. The Crofthead Black Band ; and
4. The Shotts Coal Ironstone.

1. The Upper Black Band occurs at Palace Craig, parish of Old Monkland, being the only place where it has been found worth working. It is of inferior quality to Mushet's Band, and is no longer wrought. It is 18 inches thick, and lies about 24 fathoms above the Ell coal.

2. Mushet's or Monkland Black Band lies about 16 fathoms below the Splint coal. It is of very superior quality, measures generally from 14 inches to 18 inches thick, and occupies an area of nine or ten square miles in the neighbourhood of Airdrie. It forms the principal supply to Clyde, Calder, Gartsherrie, Dundyvan, Summerlea, and Chapelhall Ironworks.

3. The Crofthead or Slaty Black Band is about the same thickness as the Monkland band, and is of equally excellent quality. It lies below the coal enumerated as workable, at what distance I cannot precisely say, nor am I able to state in what extent of area it may be found. What is known of it is principally in tack by the Messrs Holdsworth of Coltness, who are erecting furnaces for its manufacture into pig-iron. It is found also in the estate of Langside, in the parish of Shotts.

4. The Shotts ironstones overlie the Shotts Laigh Coal,

and consist of a thin band, with excellent nodules, in which occur immense quantities of bivalve shells, scales of fishes, &c. *

The shales and sandstones of the coal-measures are nearly the same in every place, and are so generally known, as to require little or no description.

Faults, &c.—Faults form a most important feature in the study of the Scottish coal-fields, as, by a correct knowledge of their direction and effects, the mineral surveyor is enabled to determine the proper spot for boring, and the miner where he should sink his shaft, without incurring those risks of failure and of capital to which the mineral adventurer is apt to be exposed through ignorance.

The principal faults or dislocations which occur in the portion of the country where the upper coals are found, generally have an easterly and westerly line of bearing, but others follow quite a different direction. Their extent is from a few inches to 70 fathoms or even 80 fathoms.

It is utterly impossible, in an account of this kind, to communicate any thing like an accurate idea of all the dislocations to which the coal-strata are subjected. I shall therefore confine myself to a notice of a few of the more important.

There is a fault passes through the town of Airdrie. It stretches from Clarkstown to Summerlea, and westward, and has the effect of placing all the workable coals, and a few of the beds which overlie the Ell coal, into the north. The Black Band ironstone crops out to the south of the fault. The extent of the fault is from 60 fathoms to 70 fathoms.

* In a bore lately made under my superintendence at Laikhall, below the outcrop of the Splint coal, there were found three bands or nodules of ironstone: first, 15 inches, good, second 12 inches, indifferent; and third, 8 inches, good.

Another fault, nearly parallel to the Airdrie one, passes through the village of Chapelhall, and Monkland Steel-works, and crosses the Calder a little above Faskine. This fault has a similar effect to that of the Airdrie one. The Ell coal, with a portion of the superincumbent strata, being found to the north of it, while the Black Band ironstone crops out to the south-west. The extent of the fault, therefore, cannot be much less than 60 fathoms or 70 fathoms.

Another fault, producing the same effect and of greater extent, passes through the villages of Newarkhill and Holytown, and the estate of Woodhall. It is this fault which throws in the Legbrannock, Woodhall, and Faskine coalbeds. The Ell coal lies at a very great depth to the north-east of this fault. The Splint coal crops out immediately to the west of it in Woodhall, so that its extent must be greater than either of the two former. The next great parallel fault is one which passes from the west of the lands of Stevenson, through those of Drumpellier, and eastward of Cuilhill. This dyke throws in a considerable portion of the red sandstone. I am not aware of any of the coals cropping out to the west of it, so its extent may be reckoned nearly equal to that of the others.

The next fault of importance is one which cuts off the red sandstone to the north-east, at the village of Sandyhills. Another, following rather a different direction, and above fifty fathoms, passes from the village of Camlachie through the Green of Glasgow to Govan Collieries. Besides these there are a number of other faults, measuring from 7 to 14 fathoms, with which I am not so minutely acquainted as to justify me entering upon a description of them.

In passing up the river Avon, we observe a number of hitches, as small faults are usually denominated, before we arrive at a place called Brockhill, a little above Cadzow Castle, where a fault is seen, which has the effect of bringing the Ell coal, which is here 8 feet or 10 feet thick, to

the surface. This dislocation must be of very great extent, because the two small seams of coal formerly mentioned as lying below the red marl of the red sandstone-formation, are only a few feet above the channel of the river in which the eight-feet coal is found. A series of faults, none of which appear to be of extraordinary extent, affect the strata on the river, till we reach Patrickholm Linn, where an immense upthrow occurs, which brings the carboniferous limestone to the surface. The undermost or Drumgray coal crops out a little farther down the river than where this disruption of the strata takes place. Farther up the river, however, all the three coals which underlie the Splint coal are found. It is not unworthy of notice that a bed of trap occurs a little below this last-mentioned fault, which has the effect of altering the coal and shale in its proximity; the beds of slaty sandstone or *faikes*, both below and above this trap bed, contain nodules of iron-pyrites. Trap, apparently the same, runs through the lands of Easter Machin, and has the effect of rendering a seam of coal into blind and smithy coal. I am not aware of any dykes, properly so called, occurring in the strata of the upper coal series; overlying masses of trap, however, are by no means uncommon. These masses are all composed of greenstone. The different places where they reach the surface, are at Airdrie, Airdrie Hill, New Monkland Church, Lea End, Claughan, Braidenhill, and Craigneuk, in the parish of East Monkland. The same trap appears again to the west of Rockrimmon, then west of Bishoploch, Craigend, and Milcroft; and at Proven Mill in the parish of Old Monkland. It is again met with at Craig Park, and at the Necropolis of Glasgow. The same rock occurs in the centre of the city in Ingram Street.

The effect of trap in altering rocks in juxtaposition is observable at several other places. At Airdrie burn, the shale and coal, both above and below it, are burned to a cinder by its action. There is a seam of coal immediately overlying the

trap at Proven Mill; the coal is completely charred, and in one place the trap is injected into the coal. At Wellpark, south of the Necropolis of Glasgow, the shale in conjunction is burned white, and abounds with veins of calcareous spar, and iron-pyrites, many specimens of which are exceedingly beautiful.

An overlying mass of trap occurs near Whiteinch on the banks of the Clyde, about three miles below Glasgow. A similar rock is seen at a place called Splindlesydes, in the parish of Shotts, and a trap-rock is observed in the Clyde at Garion Mill. These trap-rocks are all probably contemporaneous with the greenstones which compose the hills in the neighbourhood of the Kirk of Shotts; and some of them, particularly those of the parish of New Monkland, are connected with it by an unbroken chain.

3. *Carboniferous Limestone, or Lower Coal Series.*—This series is distinguishable from that of the upper coal by its containing valuable beds of limestone, fewer coal seams, greater quantities of shale and ironstone, and by its organic remains. Its general mode of superposition will be understood from the following sections taken above Craignethan Castle, at Fiddler's Gill, and Coat Castle, parish of Glassford.

Section shewing the Strata from the first Limestone to the Mainpost or under Limestone.

							Feet.	Inches.
1. Limestone,	.	.	.	.	.	.	3	0
2. Sandstone,	.	.	.	.	.	.	42	0
3. Shale,	.	.	.	.	.	.	4	6
4. Ironstone,	.	.	.	.	.	.	0	10
5. Shale,	.	.	.	.	.	.	5	0
6. Limestone,	.	.	.	.	.	.	3	0
7. Sandstone and Shale,	.	.	.	.	.	.	150	0
8. Shale,	.	.	.	.	.	.	10	0
9. Limestone,	.	.	.	.	.	.	5	0

	Feet.	Inchs.
10. Sandstone,	4	0
11. Shale,	4	6
12. Sandstone,	42	0
13. Coal,	0	4
14. Shale,	7	0
15. Coal,	0	10
16. Sandstone,	2	0
17. Shale,	3	0
18. Schistose Sandstone,	6	0
19. Smithy Coal,	1	6
20. Fire Clay,	3	0
21. Sandstone,	9	0
22. Coal,	0	1
23. Sandstone with yellow stripes,	3	0
24. Shale,	4	0
25. Cannel Coal,	0	10
26. Ironstone,	0	3
27. Light grey Clay,	1	6
28. Ironstone Balls,	0	2
29. Coal,	0	3
30. Shale,	3	0
31. Coal,	0	6
32. Sandstone,	1	6
33. Soft Coal,	1	10
34. Sulphureous Shale,	0	6
35. Dross Coal,	0	4
36. Brown Sandstone,	6	0
37. Micaceous Sandstone,	4	0
38. Ironstone,	0	2
39. Shale,	1	0
40. Dark Micaceous Sandstone,	1	0
41. Hard White Sandstone,	5	0
42. Micaceous Sandstone,	4	0
43. Shale,	0	10
44. Ironstone,	0	3
45. Shale,	0	10
46. Ironstone,	0	3
47. Shale,	4	0
48. Ironstone,	0	5
49. Shale,	2	0
50. Sandstone (grit),	5	0
51. Shale,	4	0

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	Feet.	Inches.
52. Grey Sandstone,	1	8
53. Ironstone,	0	4
54. Fire-clay, with lionstone nodules,	5	0
55. Lesmahago cannel coal (average),	1	9
56. Sandstone,	30	0
57. Slaty Sandstone,	6	0
58. Sandstone,	9	0
59. Shale,	9	0
60. Limestone,	0	10
61. Soft Coal,	0	10
62. Sandstone,	4	0
63. Fire-clay, with Ironstone nodules,	4	0
64. Sandstone (grit),	8	0
65. Shale,	8	0
66. Coarse Ironstone,	0	6
67. Slaty Sandstone,	12	0
68. Shale,	20	0
69. Limestone,	1	6
70. Shale,	10	0
71. Limestone,	2	0
72. Shale,	10	0
73. Sandstone,	1	6
74. Shale, in which 14 inches of ironstone are found in 6 feet, 20	0	0
75. Limestone,	5	0
76. Coal,	0	2
77. Sandstone,	18	0
78. White Slaty Sandstone,	6	0
79. Shale,	7	0
80. Ironstone,	0	3
81. Shale,	1	6
82. Calcareous Shale,	7	0
83. Limestone (Mainpost),	9	0
84. Shale,	3	0
85. Coarse Ironstone,	0	5
86. Shale,	1	6
87. Fire-clay,	36	0

Below the fire-clay at Fiddler's Gill, near Braidwood,
the following substances are found :

88. Hard Schistose Sandstone,	13	0
89. Shale,	1	0
90. Coal,	0	5

	Feet.	Inches.
91. Sandstone striped with carboniferous matter,	0	2
92. Shale full of shells,	0	6
93. Coarse limestone full of <i>producta gigantea</i> , &c.	2	6
94. Calcareous Shale,	2	0
95. Foul Limestone,	0	6
96. Coal,	0	5
97. Shale,	1	0
98. Chert (hard siliceous rock,)	1	0
99. Shale,	0	2
100. Indurated Clay,	0	6
101. Coarse irregularly disposed nodules of ironstone,	10	0
102. Chert,	1	0
103. Blue indurated clay,	6	0
104. Sandstone and chert alternating with loose clay-shale seen in a fault at Fiddler's Bridge,	60	0
Conglomerate, consisting of sandstone nodules coated with ferruginous concentric layers.		

The last mentioned rocks are to be regarded as a portion of the old red sandstone group.

The following section was taken at Coat Castle, near Glassford Mill Bridge on the Avon, commencing at No. 88 in the preceding section.

	Feet.	Inches.
88. Sandstone,	30	0
89. Shale,	2	0
90. Coal,	1	0
91. Clay Shale,	1	0
92. Hard siliceous sandstone (chert),	4	0
93. Blue Clay,	0	3
94. Ironstone (good),	0	0
95. Shale,	2	0
96. Ironstone (coarse),	0	2
97. Shale,	8	0
98. Large ironstone nodules (best), average,	0	5
99. Shale,	2	3
100. Ironstone (good),	0	3
101. Shale,	1	4
102. Ironstone,	0	3
103. Shale,	1	6
104. Ironstone,	0	4
105. Shale,	0	10

					Feet.	Inches.
106.	Coarse Fire-clay,	.	.	.	14	0
107.	Hard Sandstone,	.	.	.	4	0
108.	Blue Chert,	.	.	.	3	0
109.	Coarse Fire-clay,	.	.	.	1	0
110.	Blue Chert,	.	.	.	0	3
111.	Clay,	.	.	.	2	3
112.	Blue Chert,	.	.	.	3	0

By contrasting these sections with those in the appendix connected with the limestone series, the reader will perceive how subject to alternations its stratification is, and how difficult it is to identify the same stratum in different places, either by its thickness or by the rocks with which it is associated. It will also appear that the limestones of the series may be classed into the upper and the under limestones, the coals into the soft, smithy, and cannel, the ironstones into the stratified and nodular, and the sandstones into the compact, slaty, micaceous, grit or granular, and chert. The shales are bituminous, calcareous, argillaceous, and micaceous.

Limestone.—The first or upper limestone is seen nowhere in the county east of Carlisle, except at Levensat, where it is about eight feet in thickness. Above there are four feet of shale, containing an irregular band of ironstone, then a stratum of sandstone three feet in thickness. Immediately above the limestone, there is a stratum of dark slaty sandstone which has been used for roofing out-houses. This limestone consists of

				Feet.	Inches.
1.	Upper Band,	.	.	1	8
2.	Mid Band,	.	.	2	3
3.	Sole of Mid Band,	.	.	1	5
4.	Under Band,	.	.	1	9

These vary in their proportions in different places of the rock, which is rendered useless in one part by a tortuous

striped sandstone which is twisted through it. The limestone rests on two feet of shale, beneath which lies a mass of sandstone.

This limestone is highly esteemed for agricultural purposes. I found no organic remains in the stone. I was informed, however, that shells were sometimes got in it. The dip is NW.

In proceeding a few hundred yards east of Levenseat I found the out-crop of another limestone, which appears to be the same stratum as that formerly wrought at Climpy and Gare. This limestone is also wrought at Mountainblaw to the east of Wilsontown, at Backshot near West Forth, and at Braefoot. It is readily identified by the fossils found in its attendant shale. Among these Encrinurites, Turbinolites, Productæ, and Spirifers are most abundant. I collected, however, about twenty species of other shells at different quarries.

The lime rock at Gare is three feet in thickness, it has a clay-roof and clay-pavement—at Westerhouse there is,

	Feet.	Inches.
1. Clay,	9	0
2. Shale, with nodules of Ironstone,	12	0
3. Argillaceous Limestone,	1	0
4. Upper Band,	2	2
5. Argillaceous Limestone,	0	4
6. Under Band,	3	3

Many of the old workings are closed up, and the rock cannot be seen. I found no limestones to the south of Clyde, except upon the Nethan, that I could identify with either of the upper posts. But in the parishes of Shotts, New Monkland, Calder, the Barony of Glasgow, Renfrew, and Cathcart, limestones are found occupying the same stratigraphical position. One of these is found at Millcroft, parish of New Monkland, five feet in thickness.

The strata with this limestone are—

	Feet.	Inches.
1. Ferruginous Limestone,	0	5
2. Sandy Shale,	10	0
3. Drab-coloured Limestone,	5	0

The dip is SE.

The only other place where I am aware of this limestone being seen is at Oakbank near Port Dundas, Glasgow, where it has been lately discovered in digging a well by Mr Neilson. Like that of Levensat and Millcroft, the superincumbent strata are shale and sandstone. The shale intervening between the limestone and freestone rock at Oakbank is about twenty feet in thickness, and contains small nodules of ironstone. The dip is also SE. conforming with that of the rocks between it and Glasgow.

These limestones approximate in colour and quality as well as in position. The discovery of so fine a limestone in the suburbs of Glasgow cannot fail to be regarded as of importance. Their being doubtless a field of it to the north of the city of considerable extent.* Another upper limestone commonly known by the name of Cam Limestone is of a blue colour. It consists of two strata separated by a layer of shale sometimes 18 inches in thickness. The two strata make about 6 feet or 7 feet of limestone. It is not reckoned of much value for agricultural purposes, but answers very well in the

* Having been employed this summer (1837) by the Magistrates of Glasgow to examine the minerals of the royalty which are held in reserve by the corporation, I have caused a series of bores to be made near St Rollox, in the lands of Pinkstane. I found in one bore a limestone of good quality, five feet four inches thick, a bed of pipe-clay three feet thick, and several thick beds of sandstone and shale. The limestone contains abundance of shells of the genera *pecten*, *producta*, &c. and *encrinites*. In one of the bores a coal was found about four feet thick, but of very indifferent quality; another about two feet two inches, divided by a parting of fire-clay, and better than the former. In another bore in Easter Common, we found a carboniferous limestone, containing, according to analysis, 35 per cent. of iron, and 22 inches thick.—1838.

manufacture of iron. It is found at Bedlay, Garnkirk, Huggenfield, Robroyston, and Cathcart.

A few feet below it there is generally a coal varying from 1 foot to 2 feet or even 3 feet in thickness.

The following journal of a bore at Bedlay will shew its connexion with the coal which I have mentioned as intermediate with the upper and lower limestones.

	Feet.	Inches.
1. Blue Limestone,	2	0
2. Shale,	1	3
3. Blue Limestone,	3	0
4. Dark Blaes (shale),	1	2
5. Freestone Plies, (slaty sandstone) and Blaes,	0	7
6. Coal,	0	8
7. Dark hard Faikes, (micaceous slaty sandstone),	4	7
8. Slaty Sandstone,	12	1
9. Cannel Coal ?	1	4
10. Slaty Sandstone,	8	5
11. Hard grey Sandstone,	11	0
12. Dark Freestone Plies,	11	0
13. Dark Fire-clay,	5	3
14. Light Sandstone,	2	8
15. Hard grey Sandstone,	3	4
16. Light hard Sandstone,	3	4
17. Kingle (very hard sandstone)	9	5
18. Hard Slaty Sandstone,	13	4
19. Dark Fire-clay and Slaty Sandstone,	21	9
20. Dark Shale,	11	11
21. Dark Fire-clay, with Ironstone balls,	36	7
22. Dark hard Stone,	0	6½
23. Dark Freestone and Shale,	0	10½
24. Coal,	0	6
25. Dark Freestone and Shale,	11	4
26. Coal,	2	6
27. Dark grey Pavement,	0	2
28. Dark Slaty Sandstone,	5	2
29. Dark Fire-clay,	1	1
30. Hard Slaty Sandstone,	2	2½
31. Hard Band,	0	1½
32. Grey Slaty Sandstone,	5	3½
33. Kingle (indurated sandstone),	1	2

	Feet.	Inches.
34. Hard Slaty Sandstone, . . .	1	2½
35. Light Fire-clay, . . .	1	0
36. Light Sandstone and Fire-clay, . . .	12	0
37. Very hard Sandstone, . . .	18	0
38. Dark Shale, . . .	0	1½
39. Plies of Shale and Sandstone, . . .	7	2½

It seems to me that the termination of this bore is not many fathoms from the lower limestones. My reasons for thinking so are, that the coal wrought at Calderside, about 22 fathoms above the first under limestone, appears to correspond with No. 26 of the Bedlay bore, and also with the coals wrought between Glasgow and Garscube, and those at Wilsontown and Carluke. If such is the case, then there cannot fail to be laid up, in the very vicinity of Glasgow, invaluable fields of ironstone and limestone for the future supply of the iron trade. These fields have not hitherto been sufficiently explored, but there can be little doubt that the present demand for ironstone will lead to investigation.* The subject is worthy, at all events, of consideration, as immense sums are now demanded for fields containing the black band

* Since these remarks were written, something like a confirmation of their truth has been given. An acquaintance of my own, who, like myself, had examined the limestone strata and was convinced of the identity of that west of Glasgow and the Wilsontown and Carluke fields, ordered a bore at a particular spot near Jordanhill, and found near the surface seven bands, containing in all 3 feet 11 inches of superior ironstone in 30 feet of shale. I found the Jordanhill ironstones in a bore at Whiteinch, the property of James Smith, Esq. of Jordanhill, upon the banks of the Clyde; they are six in number, and give a total thickness of 5 feet of clay-ironstone of superior quality. They lie between two calcareous deposits, the undermost of which measures nearly 40 feet thick, and appears to be equivalent to a thin limestone found at Hurlit below these ironstones. Having had better opportunity of examining the strata around Glasgow, I am satisfied that the Bedlay limestone cannot be regarded as equivalent to the undermost of the upper limestones. Its true position has not yet been determined; probably it is the uppermost.

ironstone, which, however good, is of limited extent and mostly in tack. An attention to the limestone sections will make it evident that almost inexhaustible stores of ironstone of superior quality are found connected with that rock.

The under limestones may be classed into the First, Second, and Third.

The first is generally of a light grey colour, and measures from $2\frac{1}{2}$ feet to 3 feet in thickness. With respect to its organic remains, I can say but little, the rock being seldom wrought, and the old workings closed up. The second is of a bluish-grey colour, and of inferior quality to either the first or third. It measures from 4 feet to 6 feet in thickness. It contains a great variety of fossil remains, among which, in the Climpy limestone, I found the *Spirifer*, *Producta*, *Terebratula*, and *Turbinolia fungites* the most abundant. The *Crinoidea* are not so plentiful in the second under limestone as in that of Climpy, neither did I observe in it the corallines so common to the third or main-post. The third limestone is of superior quality to the rest, and is found from 4 feet to 12 feet in thickness. It is most abundant in organic remains; indeed, in some quarries it seems principally to consist of shells. Besides these remains it frequently contains beautiful specimens of the *Producta gigantea*, some of which are 5 inches or 6 inches in diameter, the *Producta Scotica* and *Martini*, several species of the *Spirifer*, *Terebratula*, *Producta*, *Pahudina* or *Ampullaria*, *Crinoidea*, *Radiaria*, and *Turbinolia*. There were one or two which I have not been able to identify with any known genera, one of which is not unlike the *Pinna*, and another to the *Pholadomya elongata*; I found these last mentioned shells in a quarry at Meadowfoot, near Loudonhill. The *Ammonite* is very rare,—I only procured two varieties. The *Euomphalus* is also rare; some specimens are found of it at Hillhead near Carluke, as also of the *Orthoceras*. I found no remains of the *Trilobite*, except a very small cast in the shale of the Gare limestones, in which, with the ex-

ception of the *Ammonite* and the *Producta gigantea*, I may mention, I found all the varieties enumerated, as contained in the main-post. The variations in its thickness and in its associated strata, will be best understood by consulting the various sections given in the Appendix. There is another limestone below the main-post, called the oyster band, from its containing immense quantities of the *Producta gigantea*. This limestone, wherever I have seen it, contains the same remains as the main-post, only it is more encrinal. Indeed, whole layers of it are altogether composed of those beautiful radiata. The stratum is seldom seen, and never wrought, being of inferior quality and thickness to the *main-post*.

The Coals of the Limestone Series vary in thickness and quality. The main coal at Wilsontown, Carluke, and Climpy lies from 28 fathoms to 32 fathoms below the lowest of the upper limestones. It corresponds in stratigraphical position with that found in the Bedlay bore,* and the coal wrought at Netherwoodside and Temple to the north-west of Glasgow, at Calderside, in the parish of Blantyre, and at Auchinheath, upon the Nethan, as has already been adverted to. It is a soft coal, and varies from 20 inches to 4 feet in thickness. To the north of Glasgow this coal contains a few inches of cannel or gas coal. The great supply of gas-coal in Glasgow, however, is from Auchinheath and Nethanfoot, where it is of very superior quality, and averages 20 inches in thickness. The limestones at Carluke have no coal immediately below them worthy of notice, whereas at Killpothall, East and West Shields, the second and third under limestones, as at Hurlit and other places, rest upon coal of considerable thickness.† The coals associated with the limestones are rarely of good quality; that at West Sidewood seems to

* Further observations have led me to doubt the identity alluded to here, the Bedlay limestone belonging to another basin, as formerly mentioned in a note.

† In the Hurlit pit there are twenty-four bands of ironstone.

be an exception. The second under limestone at Killporthall is associated with 2 feet of coal, and the third at East Shields with a seam 3 feet thick. Below the last limestone at West Shields there are two coals, one 2 feet 3 inches, and another 2 feet 10 inches. From the sections already copied it will be observed what thickness these strata attain in other places.

Connected with the limestone series there are in all about fifteen coal-seams, making with the coals of the other group about fifty in number.

The shales of the limestone series abound with clay ironstone, some of the beds of shale containing no less than 4 feet of that mineral. The shale above the third under limestone contains the greatest quantity of ironstone; sometimes the bands amount to the number of fifteen. There is also a rich ferruginous deposit in connection with the cannel coal, consisting of several bands of ironstone, amounting together to about 14 inches. The nodules and bands contained in the shale above the main-post are also of very superior quality; I observe also that below all the limestones there are ironstones well worthy of attention and research; these are best observed at Coat Castle, in the neighbourhood of Glassford mill bridge. What I consider the same ironstones were found in a well at Kilcadzow, on the very verge of the old red sandstone; the Coat Castle section has already been given. It is rarely that the rocks between the limestones and the old red sandstone can be seen, but wherever I have observed them, evidences of this ferruginous deposit appeared. (See sections 50, 51, and that taken at Fiddler's Gill, p. 354.)

Faults of the Limestone Series.—There is a very remarkable fault seen in the Rotten Calder, above Crossbasket; the under limestones and the upper red sandstone are here in juxtaposition. I am of opinion that this great trouble may be traced in a south-easterly direction as far as Cander mill bridge, about a mile east of Stonehouse.

The dip of the minerals beyond this fault is to the south-west, till we arrive at another fault below Newhouse mill. The coal wrought at Calderside is found cropping out to the south of this fault; the same coal is also wrought in the Rotten Burn: it appears to me to be the same as the under coal at Wilsontown and Carluke only of inferior thickness. The out-crop of the minerals continues in the same direction till we arrive at Rutterend limework, where we find apparently the main-post.

The fault seen at Newhouse mill, appears to be the same that deranges the rocks to the west of West Quarter and at Coat Castle; on this subject, however, I speak with hesitation, and offer no determinate opinion. It is only from the sections seen on the precipitous banks of rivers that any idea can be formed of faults. I had, therefore, next to trace the course of the Nethan. At Nethanfoot the cannel coal is found under a great mass of freestone and other rocks, among which is a bed of trap of a light grey colour, and lying as conformable as a regular stratified rock; above this the upper limestones are said to crop out. The channel of the river is nearly on the level course till we pass Nethan Castle, above which the under limestones appear and crop out. The chert and sandstone rocks, with their accompanying clays and shales, are next seen, and then the old red sandstone, about a quarter of a mile above Cora mill; it occupies, however, but a small portion of the surface, as a fault immediately occurs, which has the effect of throwing in several of the under seams of the upper coal strata. After these were found cropped out, the nature of the ground being such as to preclude particular observation, I had to rest satisfied with the information I obtained from my intelligent guide.

After passing over the strata to which I have alluded, we took the section contained in page 352, which I could not have done so accurately without the assistance of my companion. After finishing the section we came to a clay-dyke, about 100

yards in width ; the clay is of a deep blue colour, and contains fragments of sandstone, shale, and other rocks. The same limestone is found on the other side of the dyke. Two hundred yards above this limestone, which is here about 9 feet in thickness, we arrive at the old red sandstone, resting upon the brown porphyry peculiar to the district. It is remarkable that the minerals dip to the Clyde upon Nethan, and in a contrary direction upon Rotten Calder ; and that the faults are down-throws to the north upon the one, and to the south upon the other. The next extensive fault which affects the limestone series is one to the west of Carluke ; it is seen at Sampson's Slingstones, in Fiddler's Gill—passes through Braidwood, and onwards through Rae's Gill at the Thevelstone, to Garion Gill. The effect of this great fault is to throw down the minerals about 70 fathoms, for on one side of the fault lies the clay beneath the main-post of limestone, and the out-crop of the cannel coal is seen parallel to it on the other.

These are the great leading faults of the limestone group on the south. Like that of the coal it is traversed by many minor faults in various directions, but from the limestone workings being confined to the out-crops of the minerals, these have not been ascertained with such accuracy as would justify description. The limestone series on the north is also affected by many faults, but none of them are of the same magnitude as those I have described. The derangements there most worthy of notice are those occasioned by the trap-dykes afterwards to be described.

Trap of the Limestone Series.—There is, first, the trap of Dychmont Hill and the adjacent districts. The extent of this volcanic deposit will be better understood by reference to the map than by any description I can give. To the south it breaks abruptly up through the limestones, while on the north, as already mentioned, the upper red sandstone reposes

upon it at a high angle. The trap of this series is more interesting to the mineralogist than that already described as belonging to the coal district. Greenstone is the predominating rock, it frequently assumes the basaltic external form, and has often a porphyritic or an amygdaloidal structure. Beds of wacke and porphyritic claystone are also met with near Car-munock. The basaltic character is seen in a range of columns at Cathkin hills. The trap contains veins of calcareous spar, jasper, and calcedony; considerable portions of the rock consisting of what is called rotten whin, that is of loose angular or rounded fragments mixed up with smaller rubbish, the exterior of which is coloured brown by the action of the atmosphere on the ferruginous matter of the stone.

The same range is continued along the course of the Cart from Netherlee, where the river is precipitated over a tabular column of the rock, producing a pretty little waterfall. The trap in this place is only about 10 feet in thickness. It thickens towards Waterfoot and Eaglesham, at the latter place it becomes associated with porphyritic claystone of considerable thickness. In a whinstone quarry at Eaglesham I found some fine specimens of purple quartz; and also specimens of calcedony, jasper, calcareous spar, and compact felspar, some of the latter beautifully crystallized. Proceeding southward along the Cart, I observed, in another quarry, a portion of the rock of a highly porphyritic structure. Near Millhouse I met with the Osmond stone of Ure, formerly used in the construction of bakers' ovens. It is a tufaceous conglomerate, and evidently of volcanic origin. It seems to have been the result of a shower of volcanic ashes, afterwards agglutinated and consolidated by the heat and the pressure of newer trap. The trap-rocks in the parish of Eaglesham and Kilbride abound with such phenomena. These rocks may be described briefly as alternations of claystone, greenstone, and wacke. It rarely happens that an opportunity can be had of studying the effects of this body of trap upon the rocks with which it comes in contact. At Craig-

thorn hill, about a mile east of West Quarter, however, such an opportunity occurs by the trap being found in contact with a band of ironstone reposing on limestone. This ironstone is full of shells, the calcareous matter of which, is converted into iron-pyrites. I was told by Mr Jackson, proprietor of the estate, that some time ago a vein or band of iron-pyrites had been found near Craighorn Hill house 9 inches in thickness. I have nothing more particular to add respecting the overlying trap connected with the limestone series, unless indeed I were to give a mineralogical description ; but this, in the present state of geological information, is happily unnecessary, and besides, such a description would enlarge this paper to too great an extent.

I had great difficulty in ascertaining the exact limits of the trap-rocks, and in some places I had no resource but conjecture, their junction being hid from view by the soil and alluvium. The lines of demarcation, however, of that and the other groups were determined after the most diligent research and mature deliberation.

The fissures in the limestone rocks are generally filled with crystallized carbonate of lime. These crystals are sometimes associated with iron-pyrites, producing a beautiful effect by their contrast of colour and the arrangement of their crystals ; the same phenomenon is sometimes observed in cavities of the iron mines of the upper coal series.

Besides the trap I have described, there are three trap-dykes in the districts surveyed. The first of these is seen crossing the country between Snabe limeworks and High Drumellog. It is of considerable width. A little to the south of the dyke there is an out-crop of a three-feet coal, accompanied by four bands of clay ironstone. The coal and ironstone would make a profitable working, but they are considered of limited extent and are prohibited from being wrought. To the east of the dyke there is a great body of clay-shale, some of which is used for hones ; this mineral is of an ash-grey

or reddish-brown colour, fracture compact, even, passing into fine earthy, indeterminately angular, and rather heavy.

On the north of the county two trap-dykes, nearly parallel to each other, are found crossing the county in an easterly and westerly direction. They vary in width from 30 yards to 40 yards. Their effects on the strata through which they have penetrated are rarely discernible, the trap, in a majority of cases, being seen merely raising its grey head above the sod. In some places however, these dykes form ridges from 30 feet to 40 feet in height as at Claydens and Cameron. The tunnel at Bedlay, being cut through the south dyke, the anxiety of the geologist is somewhat relieved. The dyke is seen there cutting through the blue limestone and its accompanying strata. The shale in contact with the trap is burned white, and the limestone is of a more indurated texture. On one side the strata lie at right angles with the perpendicular of the dyke, on the other at an angle of 45° . There is another trap-dyke on the north which runs parallel to these through the parishes of Slamannan and Cumbernauld. A beautiful example of a perpendicular trap-dyke penetrating sandstone may be seen at Kenmure quarry near Bishop Bridge.

The question concerning the origin of trap is now at rest, but if any thing were necessary to establish the opinion that it was once in a state of fusion, and capable by its heat of altering the rocks with which it came in contact, evidences the most incontrovertible could be adduced from the trap in the territory I have surveyed.

The soil connected with this class of rocks is exceedingly variable, being in some places of the poorest, and in others of the richest kind.

The loam is generally lighter than that of the upper coal-beds. Its fertility seems rather to depend on the altitude of the place than any particular ingredient of the rock. The soil where the trap-rocks predominate is invariably the most susceptible of improvement, and when well drained produces

excellent and heavy crops. I have not noticed any thing peculiar with respect to the vegetation of timber in the limestone district.

4. *Old Red Sandstone Series*.—The rocks composing this series have been so often described that, were it not for the satisfaction of those who may not be conversant with geological subjects, it would be almost unnecessary to enter into detail. In hand-specimens many of the portions of the group are not distinguishable from the rocks of the new red sandstone, but in the aggregate the distinctive characteristics are evident enough. Before proceeding to describe the old red sandstone, I may allude to a class of rocks intermediate with it and the limestone group. These consist of chert, light grey sandstones, clay-shales, and clays, scarcely so slaty as to deserve the name of shale. Some of the cherts are slightly calcareous and coarse grained, others are of a bluish shade, fine grained, and much indurated and present the appearance of trap.

In contact with a stratum of chert, near Carluke, coal is found charred, as when in juxtaposition with trap. The chert seems to have been subjected to great heat. Were it in connection with rocks of igneous origin, the phenomenon might be satisfactorily explained, but it is found resting upon coarse-grained sandstone, which has undergone no alteration from volcanic action. While treating of siliceous rocks, I may mention a fact I forgot to state in the description of the limestone group, that below one of the limestones at Birkfield, near Carluke, there is a bed of white quartz. I got a specimen from Mr Ross, proprietor of the farm; but, owing to the working being closed up, I had not an opportunity of seeing it *in situ*. I was disposed to think it must have found its way hither in a vein, but Mr Ross informed me that it lay perfectly conformable with the limestone. I found many specimens of a blue quartz lying in the burn, which seemed

to belong to the neighbouring strata, not having that water-worn appearance which transported fragments always have.

The old red sandstone series consists of a series of conglomerates, sandstones of different colours, shales, and clays. The predominating rock is a schistose reddish-brown sandstone. This rock attains great thickness in some of its layers, being seen not less than 400 feet in some places, particularly at Cartlane Crags. Parts of the rock are so highly indurated as to be incapable of being wrought, and other parts so schistose as to be of little use in building. It occurs also in thin layers, alternating with conglomerate, which is almost of universal occurrence in the upper portions of the group. In the stream above Burnhouse, beyond Carluke, I passed over more than a dozen beds of conglomerate, alternating with sandstone, some of which were of a dull red, and others of a brown colour, occasionally variegated with stripes and spots of a lighter shade. A little farther on, I came to chert and white sandstone associated with clay, then a basalt dyke, or what appeared to be a dyke, for I could not well determine, only a small portion of the trap being seen. In ascending the hill towards Kilcadzow, I again came upon the red sandstone, resting upon a bed of brown porphyry. At Kilcadzow, I found the base of the hill flanked with conglomerate. It is also seen along the whole line of the series eastward, wherever the rocks are so denuded as to permit observation. A breccia occurs at Stonebyres Falls, where it forms a beautiful table rock, from which the rush of the cataract is beheld in all its grandeur.

The conglomerate appears to be confined to the upper portion of the stratification of the series. It is an aggregate of portions of the older rocks of granite, gneiss, mica-slate, clay-slate, quartz, Lydian-stone, jasper, and the different varieties of trap. In some portions the trap predominates, and is agglutinated by a siliceous basis, in which cases it is of extreme hardness. The rock at Stonebyres Falls is a

beautiful instance, not only of the great variety of which the conglomerate is composed, but of the firm adhesion of its parts.

At Cartlane Crag, and in a rock above Lanark, there are veins of the sulphate of barytes. That at Cartlane is from 6 inches to 18 inches in thickness; an excavation of which forms a cavity in the rock, well known by the name of Wallace's Cove. Tradition has been very busy in affording hiding-places to the immortal and persecuted champion of Scotland. The keeper of the bridge led the way down a steep descent, to shew me a vein of trap and calcareous spar. This vein, like those of the barytes, extends perpendicularly through the rock, which, at this spot, attains a height of not less than 400 feet.

The great object of my survey being to exhibit the mineral resources of the county in coal, lime, and ironstone, I had not time to traverse the extensive district occupied by the old red sandstone, for almost any other purpose than to trace its northern boundary, and the limits of the trap in conjunction with it. There may therefore be phenomena connected with the series of which I am necessarily unacquainted. As I purpose, however, to complete the survey of the county, I shall have a better opportunity of devoting more of my attention to the group, as well as to the trap-rocks, to which it seems in a great measure to owe its superior elevation.*

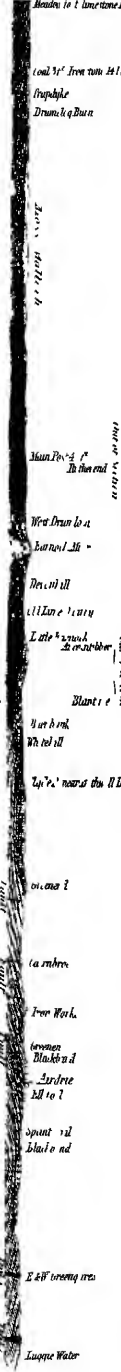
General Remarks on the Disposition of the Strata.—The old red sandstone is found to the north, in the county of Dumbarton, occupying the same geological position as in the district I have attempted to describe. The space between its elevation on the south and north may be regarded as a portion of a great valley, partially filled up by the deposition of the newer strata. When the old red sandstone formed the channel of the waters, it appears to have presented inequa-

* A more accurate survey of the coal-field north of Glasgow, and to the west, than I had leisure to execute, is much to be desired.

lities similar to those found at the bottom of the present ocean ; upon these inequalities the carboniferous rocks were deposited.

Proofs, however, exist of the newer rocks having been elevated to the surface, and afterwards submersed. This is particularly demonstrable from a quarry near Kelvin, where the sand constituting the rock appears to have been deposited round the stems of a forest, a great many trunks of trees having been found in the perpendicular position of their growth with their roots ramified in the rock. Through the care of Mr Smith of Jordanhill, two of these have been preserved in the quarry ; the matrix of one or two more is seen a few yards distant. This is the only instance I have seen of stems of large petrified trees preserving the perpendicular position ; an angle of ten or twenty degrees is not uncommon, but the horizontal position is that of most frequent occurrence. The coloured sections, Nos. 1, 2, and 3, will convey to the reader an idea of the general arrangement, and the variations of the lines of inclination and bearing of the strata, as well as of the principal faults and their effects, better than any verbal description.

The dip or rise of the strata varies from 1 in 6 to 1 in 12, rarely exceeding the former, except in the vicinity of a fault, or dyke, occasioned by those subterranean forces of which the trap-rocks continue the monuments. The courses of rivers and their tributaries are often indicative of those depressions of the surface known by the name of troughs. Thus the Clyde may be considered as the trough of the Lanarkshire coal-measures, the dip being almost universally in its direction on either side. The northern anticlinal line, or where the rocks change from a south and south-west dip to one in a contrary direction, may be traced from the neighbourhood of Garnkirk to Breakenhirst, north of New Monkland ; from Breakenhirst to Drumgavel, from thence to East Bogside, west of the Kirk of Shotts, and onwards to the Shotts Iron-Works. The Wilsontown and Carluke fields lie in the



forms of basins, and of course dip accordingly. The dip of the strata upon Nethan is to the north-west by west, and the faults are down-throws to the south.

Upon the Rotten Calder the inclination of the strata has been already described. At Glasgow the dip is to the south-east and north-east. The limestone strata to the south of Dychmont Hill generally dip in a southerly direction.

I have little more to add, unless indeed I were condescending upon topographical description; but that was not the object of survey. I cannot close these remarks, however, without alluding to the very interesting and important character of the minerals of the county. Its limes, coals, ironstones, and clays, are almost inexhaustible; and furnishing as they do the means of so much employment to the community, and of affluence to the man of property and the manufacturer, we may look forward to ages of undiminished commercial prosperity.

Mineral Springs.—None of these have attained much celebrity for their medicinal virtues. The principal are sulphureous chalybeates at Avon Glen, Blantyre, Airdrie, and in Glasgow Green. That near Airdrie is the strongest, and according to tradition was once in considerable repute. These mineral qualities are derived from the sulphureous, aluminous, and ferruginous properties of the shales through which they pass. In many places waters impregnated with lime exuding from the earth are found, converting the Cryptogamia among which they flow into the solid consistency of stone. Very fine instances of this encrusting process may be seen on the Avon below Cadzow Castle, at Nethan Foot, in Fiddler's Gill near Carluke, and many other places. The wells among the trap-rocks are generally of the purest and coolest.

Table of Heights above the Level of the Sea. Copied from the Botany of Lanarkshire, by the Rev. William Patrick.

	Feet.
Glasgow,	79
Rutherglen Haughs,	80
Hamilton,	100
Lanark Bridge,	220
Town of Lanark,	650
Carnwath,	600
Strathaven,	450
Carluke,	500
Leamahago,	450
Dychmont Hill,	700
Kirk of Shotts,	650

Explanation of Plate IX. containing coloured Geological Sections of the Lower Ward of Lanarkshire.

Section 1st, represents the mixed formations across the county, stretching in a straight line from Loudon Hill to Luggie Water, a distance of about 23 miles.

Section 2d, represents the formations stretching from Thriep-land Burn to Headlesscross, being a straight line distance of about 19 miles.

Section 3d, represents the formations from Nethanfoot to Auchlochan, being a distance as the crow flies of about 6 miles.

Section 4th, represents the Carboniferous Limestone or lower Coal series, from Milton House to Mosshat, comprehending a distance in a straight line of about 13 miles.

Section 5th, stretching in a straight line about 14 miles, represents the mixed formations between Coatside and Craig-end.

The directions of these different sections are marked with faint lines on the geologically coloured map of Lanarkshire given in this number of the Transactions.

APPENDIX.

Section I.—*Govan Engine-Pit.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath. ft. in.
1. Earth,				0 2 0
2. New red sandstone,				2 4 0
3. Grey sandstone and shale,				18 0 0
4. 1st Coal,	4 6			
5. Sandstone and shale,				5 0 0
6. Soft coal,	2 0			
7. Slaty sandstone and shale,				6 1 0
8. Marble band (shell ironstone),		0 3		
9. 2d Coal,	3 9			
10. Slaty sandstone,				4 5 0
11. Marble band,		0 3		
12. Slaty sandstone,				0 3 9
13. 3d Coal,	5 0			
14. Sandstone,				10 3 0
15. 4th Coal, Hump,	3 0			
16. Slaty sandstone and shale,				9 1 0
17. 5th Coal (Splint),	3 10			
18. Fire-clay from 0 to 12 feet,				0 1 6
19. 6th Main Splint Coal,	6 6			
	Ft. in.			
Top, mixed,	5 0			
Shale,	1 0			
Soft coal,	0 6			0 1 0
Splint,	0 7			
Soft,	0 5			
	7 6			
20. Sandstone and shale,				13 0 0
21. 7th Coal	2 6			
Rocks,				71 5 9
Coal,				3 5 7
Ironstone,				0 0 6
				75 5 10

Dips various; Splint Coal crops out
at Strabungo.

Section II.—*Fullerton Minerals.*

1. Earth, mud and clay,	8 0 0
2. Sandstone,	14 0 0
3. Shale and fire-clay,	1 1 0

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Section II.—*continued.*

		Coal.	Ironstone.	Limestone.	Rocks.
		Ft. in.	Ft. in.	Ft. in.	Fath. ft. in.
4. Slaty sandstone,					0 1 0
5. 1st Coal,		4 0			
6. Shale,					1 0 0
7. Sandstone,					3 2 0
8. Shale, with small nodules of iron-					
stone,					8 0 0
9. Slaty sandstone,					0 5 0
10. 2d Coal,		3 10			
11. Slaty sandstone,					4 0 0
12. Shale,					0 5 0
13. Marble band,			1 0		
14. Slaty sandstone,					1 6 0
15. 3d Coal,—	Soft,	Ft. in. 1 10			
	Splint,	2 0			
	Stone,	0 2			0 0 2
	Soft,	1 6			
		5 4			
16. Slaty sandstone,					0 3 0
17. Sandstone,					0 10 0
18. Shale and slaty sandstone,					2 4 6
19. Ironstone,			0 1½		
20. Shale,					0 0 9
21. 4th Coal,		2 9			
22. Fire-clay,					0 1 1
23. Shale,					1 5 9
24. Sandstone,					0 0 9
25. Shale, including two bands of					
ironstone,			0 3		0 1 6
26. 5th Coal,—	Splint,	2 1			
	Soft,	0 8			
		2 9			
27. Shale,					1 1 0
28. Sandstone,					0 1 6
29. Shale,					0 1 6
30. 6th Soft smithy Coal,		2 9			
31. Fire-clay,					0 0 3
32. Slaty sandstone,					2 0 3
33. Shale, with ironstone nodules,					0 1 3
34. Sandstone,					0 0 2
35. Coal,		1 7			
36. Sandstone,					1 3 11
37. Slaty sandstone,					2 0 6
38. Shale, with 4 inches of ironstone,			0 4		1 1 3
39. Slaty sandstone,					1 2 4
40. Shale,					0 2 0
41. Coal,		1 6			

Dip S. 50° W. 1 in 12.

Section III.—*Hamilton Farm.*

1. 1st Coal,	4 1		
2. Sandstone and shale,			15 0 0
3. 2d Coal,	4 3		

Section III.—*continued.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	1 st h. ft. in.
4. Sandstone and shale, &c.	5 0	.	.	4 0 0
5. 3d Coal,	.	.	.	11 2 0
6. Sandstone and shale,	2 9	.	.	3 2 0
7. 4th Coal,	3 3	.	.	.
8. Sandstone and shale,	.	.	.	.
9. 5th Coal,	.	.	.	.

Section IV.—*Dalmarnock Pit.*

1. Soil and alluvium,	.	.	.	7 3 0
2. Sandstone and shale,	.	.	.	37 4 0
3. 1st Coal,	4 2	.	.	14 0 0
4. Sandstone and shale,	.	.	.	6 4 0
5. 2d Coal,	4 6	.	.	10 0 0
6. Sandstone and shale,	4 6	.	.	4 0 0
7. 3d Coal,	1 10	.	.	.
8. Sandstone and shale,	2 2	.	.	.
9. 4th Coal,	.	.	.	.
10. Sandstone and shale,	.	.	.	.
11. 5th Coal (Splint),	.	.	.	.

Section V.—*Tollcross Minerals.*

1. 1st Coal,	4 0	.	.	16 0 0
2. Sandstone and shale,	.	.	.	6 0 0
3. 2d Coal,	4 6	.	.	13 3 0
4. Sandstone and shale,	.	.	.	3 0 0
5. 3d Coal,	5 6	.	.	.
6. Sandstone and shale,	2 4	.	.	.
7. 4th Coal,	.	.	.	.
8. Sandstone and shale,	2 10	.	.	.
9. 5th Coal (Splint),	.	.	.	.

Section VI.—*Stonelaw near Rutherglen.*

1. 1st Coal,	4 0	.	.	15 0 0
2. Sandstone and shale,	.	.	.	6 0 0
3. 2d Coal, sulphureous at bottom,	5 0	.	.	.
4. Sandstone and shale,	.	.	.	.
5. 3d Coal,	5 2	.	.	.

Section VII.—*Mount Vernon.*

1. Sandstone, &c.	.	.	.	31 0 0
2. 1st Coal,	1 2	.	.	27 0 0
3. Sandstone, &c.	.	.	.	6 0 0
4. 2d Coal,	4 0	.	.	.
5. Sandstone and shale,	.	.	.	.
6. 3d Coal,	4 0	.	.	.

NOTE.—The strata between the coals in the last five sections nearly correspond with the two first. These sections are sufficiently descriptive of the Glasgow coal-fields.

Section VIII.—*Cambuslang Minerals, Old Pit.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath. ft. in.
1. Alluvium, &c.	.	.	.	3 0 0
2. Sandstone,	.	.	.	7 0 0
3. 1st Coal,	3 0	.	.	
4. Sandstone and shale,	.	.	.	19 1 10
5. 2d Coal,	4 6	.	.	
	Ft. in.			
Splint,	3 0			
Shale,	6 1			
Soft,	1 6			
	<hr/> 4 7			
6. Sandstone,	.	.	.	4 3 8
7. Shale,	.	.	.	2 4 2
8. 3d Coal,	6 0	.	.	
	Ft. in.			
Splint,	3 0			
Shale,	0 1			
Soft,	3 0			
	<hr/> 6 1			

Section IX.—*Quilhill Pit.*

1. Alluvium,	.	.	.	8 0 0
2. Red sandstone,	.	.	.	0 3 0
3. Shale and slaty sandstone,	.	.	.	2 0 0
4. Upper Coal,	2 6	.	.	
5. Grey sandstone,	.	.	.	1 4 0
6. Fire-clay,	.	.	.	
7. Sandstone and shale,	.	.	.	13 2 0
8. Coal,	0 6	.	.	
9. Sandstone and shale,	.	.	.	6 0 0
10. 1st, or Ell Coal,	3 0	.	.	
11. Sandstone and shale,	.	.	.	3 0 0
12. 2d Coal, Pyotshaw,	5 0	.	.	
13. Slaty sandstone,	.	.	.	0 2 0
14. Fire-clay,	.	.	.	0 2 0
15. 3d, or Main Coal,	5 0	.	.	
16. Sandstone and shale,	.	.	.	6 0 0
17. 4th, or Humph Coal,	2 0	.	.	
18. Sandstone and shale,	.	.	.	6 0 0
19. 5th, or Splint Coal,	3 6	.	.	
20. Shale, &c.	.	.	.	1 5 0
21. 6th Coal,	2 6	.	.	
22. Sandstone and shale,	.	.	.	2 2 0
23. Marble band,	.	1 6	.	
24. Sandstone, ironstone, and shale,	.	.	.	10 0 0

Section X.—*Gartgill Minerals.*

1. 1st Coal,	2 2	.	.	
2. Sandstone and shale,	.	.	.	15 0 0
3. 2d Coal,	4 10	.	.	
4. Shale,	.	.	.	0 2 0
5. 3d Coal,	4 4	.	.	

Section X.—*continued*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath. ft. in.
6. Sandstone and shale,	.. .	.	.	8 0 0
7. 4th Coal, .	1 6	.	.	7 3 0
8. Sandstone and shale,	.	.	.	
9. 5th Splint Coal,	3 4	.	.	

Section XI.—*Gartsherrie Minerals.*

1. 1st Coal,	2 0	.	.	8 0 0
2. Sandstone and shale,	.	.	.	
3. 2d Coal,	3 3	.	.	3 3 0
4. Sandstone and shale,	.	.	.	
5. 3d Coal, .	4 0	.	.	7 3 0
6. Sandstone and shale,	.	.	.	
7. 4th Coal, .	1 4	.	.	7 3 0
8. Sandstone and shale,	.	.	.	
9. 5th Coal, .	3 4	.	.	

Section XII.—*Kips Minerals.*

1. 2d Coal,	4 0	.	.	14 0 0
2. Shale and sandstone,	.	.	.	
3. 3d Coal,	3 9	.	.	7 0 0
4. Sandstone and shale,	.	.	.	
5. 4th Coal,	1 8	.	.	7 0 0
6. Sandstone and shale,	.	.	.	
7. 5th or Splint Coal,	5 0	.	.	

Section XIII.—*Milnfaulds Pt.*

1. Alluvium,	.	.	.	7 4 0
2. Shale and slaty sandstone,	.	.	.	2 3 0
3. Sandstone,	.	.	.	0 2 0
4. Coal,	0 8	.	.	0 2 2
5. Fire-clay,	.	.	.	1 5 0
6. Sandstone,	.	.	.	
7. Faiks (loose micaceous laminated sandstone),	.	.	.	0 2 0
8. Sandstone,	.	.	.	3 2 0
9. Coal,	0 6	.	.	4 3 0
10. Shale and faiks,	.	.	.	1 3 6
11. Sandstone and faiks,	.	.	.	6 2 6
12. Hard sandstone,	.	.	.	
13. Coal,	0 11	.	.	1 3 4
14. Shale with ironstone band,	.	.	.	1 5 6
15. Sandstone alternating with shale,	.	.	.	3 1 3
16. Shale,	.	.	.	0 0 10
17. Muscol band and wild coal,	.	.	.	
18. Coal (clean),	2 3	.	.	0 5 7
19. Shale and faiks,	.	.	.	0 5 6
20. Bituminous shale,	.	.	.	
21. Coal (rather foul),	0 8	.	.	1 4 10
22. Light clay-shale with faiks,	.	.	.	0 3 9
23. Light indurated sandstone,	.	.	.	
24. Light clay-shale with thin irregular bands of ironstone, one of them 2 inches thick, full of bivalve shells,	.	.	.	1 2 6

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Section XIII.—*continued.*

	Coal.	Ironstone.	Limestone.	Rocks.	
	Ft. m.	Ft. in.	Ft. in.	Fath.	ft. in.
25. Shale a little darker,	.	.	.	0	1 0
26. Black ironstone and shale	.	1 0	.	0	0 10
27. Light clay-shale with lips of stone,	.	.	.	1	2 10
28. Coal.	0 5	.	.	.	.
29. Light clayshale with thin sand- stone strata,	.	.	.	2	5 7
30. Sandstone with layers of grey faiks,	.	.	.	0	2 10
31. Shale,	.	.	.	0	0 6
32. Sandstone,	.	.	.	0	0 10
33. Shale,	.	.	.	0	2 11
34. Sandstone and faiks,	.	.	.	1	1 7
35. Sandstone,	.	.	.	0	0 9
36. Light shale and sandstone,	.	.	.	0	2 2
37. Sandstone and shale,	.	.	.	1	2 2
38. Light clay-shale,	.	.	.	0	1 3
39. White sandstone,	.	.	.	0	2 8
40. Dark shale,	.	.	.	0	2 2
41. 1st Coal (Ell),	1 1	.	.	1	2 11
42. Shale and sandstone,
43. Coal,	2 2	.	.	.	.
44. Grey faiks,	.	.	.	2	0 0
45. Shale and sandstone,	.	.	.	3	2 6
46. 2d Coal (Pyotshaw),	3 10	.	.	.	.
47. White sandstone,	.	.	.	6	0 0
48. Sandstone and shale,	.	.	.	7	1 0
49. 3d Coal (Main),	2 9	.	.	.	.

There is a fault or trouble in the pit at this part of the section; below this fault the Humph and Splint Coals are found, the former 1½ foot, and the latter 4 feet in thickness.

Section XIV.—*Carnbrae Minerals.*

1. 1st Coal,	1 8	.	.	.
2. Sandstone and shale,	.	.	.	7 0 0
3. 2d Coal,	3 6	.	.	.
4. Sandstone and shale,	.	.	.	3 0 0
5. 3d Coal,	3 2	.	.	.
6. Sandstone and shale,	.	.	.	7 0 0
7. 4th Coal,	1 0	.	.	.
8. Sandstone and shale,	.	.	.	5 0 0
9. 5th Coal,	4 4	.	.	.

Section XV.—*Greenend Minerals.*

1. 2d Coal,	3 6	.	.	.
2. Sandstone and shale,	.	.	.	6 0 0
3. 3d Coal,	4 0	.	.	.
4. Sandstone and shale, and 4th Coal,	1 2	.	.	14 0 0
5. 5th Coal,	3 6	.	.	.
6. Sandstone and shale,	.	.	.	14 0 0
7. Black band ironstone,	1 6	.	.	.

Section XVI.—*Journal of a Bore at the west corner of the Lands of Palace Craig, from the Upper Black Ironstone to the Ell Coal.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath. ft. in.
1. Black ironstone,	.	1 0		
2. Shale containing thin bands of ironstone,	.	.	.	0 4 6
3. Sandstone and shale,	.	.	.	4 1 0
4. Coal with a thin stone parting,	2 10			
5. Sandstone,	.	.	.	0 7 0
6. Shale,	.	.	.	0 1 6
7. Black shale and clay,	.	.	.	0 3 10
8. Coal,	0 8			
9. Slaty clay,	.	.	.	0 0 8
10. Fire-clay,	.	.	.	0 1 4
11. White do.	.	.	.	0 2 0
12. Sandy faiks and white clay,	.	.	.	0 4 0
13. Sandstone,	.	.	.	0 1 10
14. Shale and 10 inches of ironstone,	.	0 10	.	0 5 7
15. Black tull,	.	.	.	0 0 6
16. Ironstone sunk to	.	1 6		
17. Fire-clay pavement,	.	.	.	0 1 7
18. Black tull,	.	.	.	0 1 4
19. Shale and grey faiks,	.	.	.	2 0 6
20. Grey shale and black tull,	.	.	.	0 1 10
21. Sandstone and shale,	.	.	.	0 5 7
22. Coal,	0 2			
23. Shale and clay,	.	.	.	0 7 2
24. Sandstone,	.	.	.	6 1 0
25. Shale 15.4, and clay 8 inches,	.	.	.	1 4 0
26. Ell Coal 2 feet 10 inches, pavement 9 inches, coal 1 foot 10 inches,	.	5 5		

Section XVII.—*Coathill Pit.*

1. Alluvium,	.	.	.	.	4 5 0
2. Shale and till,	.	.	.	.	1 2 4
3. Coal,	.	0 6	.	.	
4. Fire-clay,	.	.	.	.	0 3 6
5. Faiks,	.	.	.	.	0 5 6
6. Sandstone,	.	.	.	.	0 1 3½
7. Till (slaty clay),	.	.	.	.	0 0 2
8. Sandstone,	.	.	.	.	0 1 11
9. Faiks,	.	.	.	.	0 1 9
10. Sandstone,	.	.	.	.	0 1 5
11. Shale,	.	.	.	.	0 0 2½
12. Sandstone,	.	.	.	.	0 2 5
13. Faiks,	.	.	.	.	0 0 5
14. Indurated sandstone,	.	.	.	.	0 1 10
15. Shale,	.	.	.	.	0 0 10
16. Indurated sandstone,	0 5 5
17. Shale,	1 4 10½
18. Sandstone and faiks,	3 5 3 0
19. Sandstone,	0 3 10

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	Coal.		Limestone.	Rocks.	
	Ft. in.	Ft. in.	Ft. in.	Fath.	ft. in.
20. Shale,				0	2 0
21. 1st Coal, parting 6 inches,	1	8		0	0 0
22. Till,				0	0 5
23. Fire-clay,				0	0 11
24. Faiks,				0	0 9
25. Sandstone,				0	0 6
26. Coal,	0	4½			
27. Faiks,				0	1 0
28. Sandstone,				0	0 6½
29. Shale,				0	1 10
30. Coal,	1	1½			
31. Fire-clay,				0	0 2½
32. Mixture of shale and thin sandstone bands,				3	0 7½
33. Sandstone,				0	2 9
34. Faiks,				0	0 9
35. Sandstone,				1	0 8
36. Faiks,				0	0 3
37. Sandstone,				0	3 0
38. Shale with ironstone bands,				0	5 9
39. 2d Coal,	3	8½			
40. Bituminous Shale,				0	1 6
41. Fire-clay,				0	8 0
42. Faiks,				0	1 11
43. Sandstone,				0	3 6
44. Faiks and sandstone,				0	5 11
45. Sandstone,				2	3 0
46. Faiks,				0	0 4
47. Sandstone,				0	0 6
48. Faiks,				0	0 2
49. Sandstone,				0	0 10
50. Faiks,				0	0 10
51. Sandstone,				0	0 9
52. Shale,				0	0 4
53. 3d Coal,	3	0			
54. Grey sandstone,				0	1 0
55. Coal,	0	6			
56. Bituminous shale,				0	0 6
57. Faiks,				0	1 2
58. Sandstone,				0	0 6
59. Faiks with sandstone,				0	2 2
60. Shale,				0	2 2
61. Faiks with sandstone,				0	2 5
62. Shale and sandstone,				0	3 0
63. Coal,	0	5			
64. Light shale and faiks,				1	2 0
65. Shale and sandstone, containing coarse kinds of ironstone,				0	4 0
66. Coal,	0	6			
67. Shale and fire-clay,				0	2 3
68. 4th Coal,	1	6			
69. Sandstone,				0	2 3

Section XVII.—*continued.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath. ft. in.
70. Faiks,	:	:	:	0 0 6
71. Sandstone,	:	:	:	0 4 1
72. Grey faiks with sandstone,	:	:	:	1 0 11
73. Sandstone,	:	:	:	1 5 0
74. Faiks with sandstone,	:	:	:	0 5 7
75. Sandstone;	:	:	:	0 1 0
76. Shale with sandstone and iron- stone bands,	:	:	:	0 3 10
77. 5th Coal (Splint)	3 6	:	:	0 0 1½
78. Sandstone,	:	:	:	0 0 1½
79. Coal,	0 7	:	:	

Section XVIII.—*Whiflet Pit, No. 3.*

1. Alluvium,	:	:	:	4 0 0
2. Sandstone, faiks, and shale,	:	:	:	5 2 0
3. 1st Coal (Ell)	2 1	:	:	
4. Shale,	:	:	:	0 4 10
5. Coal,	1 2	:	:	
6. Fire-clay,	:	:	:	0 2 0
7. Faiks,	:	:	:	3 1 9
8. Sandstone,	:	:	:	1 2 0
9. Shale,	:	:	:	0 5 0
10. 2d Coal (Pyotshaw),	3 2	:	:	
11. Whiflet Pit, No. 2. to the Splint Coal,	:	:	:	26 0 0
12. Splint Coal,	3 6	:	:	
13. To the black band ironstone	:	:	:	13 0 0
14. Black band ironstone,	:	1 6	:	

Section XIX.—*From the Pavement of Splint Coal in Hunter's Pit, Greenend.*

1. Fire-clay,	:	:	:	0 2 3
2. Grey faiks,	:	:	:	1 2 0
3. Sandstone,	:	:	:	0 5 6
4. Coal,	2 8	:	:	
5. Fire-clay,	:	:	:	0 5 7
6. Faiks with sandstone,	:	:	:	1 4 0
7. Shale,	:	:	:	1 0 0
8. Mussel band,	:	6 0	:	
9. Soft shale,	:	:	:	0 2 10
10. Coal,	1 3	:	:	
11. Sandstone,	:	:	:	0 2 8
12. Shale,	:	:	:	0 2 0
13. Coal,	0 10	:	:	
14. Ironstone,	:	1 6	:	

Section XX.—*Palace Craig Pit, No. 1.*

1. Surface,	:	:	:	3 0 0
2. Light fire-clay,	:	:	:	4 0 0
3. Sandstone and faiks,	:	:	:	0 1 10
4. Sandstone,	:	:	:	1 0 0
5. Dark faiks,	:	:	:	0 1 1

Section XX.—*continued.*

	Coals.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath. ft. in.
6. Sandstone,	.	.	.	0 2 3
7. Shale and ironstone band,	.	1 0	.	0 1 6
8. Soft shale,	.	.	.	0 2 4
9. Coal,	1 1½	.	.	.
10. Striped slaty sandstone,	.	.	.	0 0 3½
11. Sandstone and faiks,	.	.	.	0 0 5½
12. Shale,	.	.	.	1 0 5
13. Tull,	.	.	.	0 0 5
14. Coal,	0 1½	.	.	.
15. Till,	.	.	.	0 0 1½
16. Sandstone and faiks,	.	.	.	0 3 0
17. Sandstone,	.	.	.	0 2 0
18. Shale with sandstone,	.	.	.	4 0 0
19. Shale,	.	.	.	0 0 4
20. Mussel band,	.	0 1	.	0 0 4
21. Shale,	.	0 5	.	.
22. Mussel band,	.	0 5	.	.
23. Coal,	0 5	.	.	0 0 3
24. Fire-clay,	.	.	.	.
25. Coal,	1 4	.	.	0 0 6
26. Mixture of fire-clay and coal,	.	.	.	0 1 8
27. Shale and sandstone,	.	.	.	0 2 4
28. Sandstone and faiks,	.	.	.	0 1 6
29. Faiks,	.	.	.	0 4 0
30. Sandstone and faiks,	.	.	.	1 0 0
31. Faiks and shale,	.	.	.	0 3 0
32. Fire-clay,	.	.	.	0 5 0
33. Sandstone and faiks,	.	.	.	0 2 4
34. Shale and faiks,	.	.	.	1 5 0
35. Sandstone and ditto,	.	.	.	1 0 0
36. Sandstone with blue faiks,	.	.	.	0 3 0
37. Faiks,	.	.	.	0 2 10
38. Bituminous shale,	.	.	.	.
39. Coal,	2 0	.	.	1 0 0
40. Faiks and shale,	.	.	.	0 2 0
41. Sandstone,	.	.	.	0 1 3
42. Faiks with shale,	.	.	.	2 2 10
43. Sandstone,	.	.	.	1 2 3
44. Dark faiks,	.	.	.	0 0 8½
45. Sandstone,	.	.	.	0 3 8
46. Dark faiks,	.	.	.	0 3 11
47. Sandstone,	.	.	.	0 0 5
48. Faiks,	.	.	.	0 0 10
49. Sandstone,	.	.	.	0 3 0
50. Shale with sandstone,	Ft. in.	.	.	.
51. 1st or Ell Coal,	2 9	.	.	.
Wild ditto,	0 2	.	.	.
Grey stone,	0 10	.	.	0 0 10
Coal,	1 8	.	.	.
	5 5			
	0 10			
	4 7	4 7		

Section XXI.—*Faskine Minerals.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath. ft. in.
1. Alluvium, . . . . .	.	.	.	5 3 0
2. Shale, . . . . .	.	.	.	7 4 7
3. Marble band, . . . . .	.	0 6	.	
4. Coal,	1 3	.	.	
5. Sandstone and shale, . . . . .	.	.	.	4 4 9
6. Coal,	1 3	.	.	
7. Sandstone and shale, . . . . .	.	.	.	3 5 8
8. Coal,	1 8	.	.	
9. Shale with nodules of ironstone, . . . . .	.	.	.	3 5 6
10. Coal,	1 0	.	.	
11. Sandstone and shale, . . . . .	.	.	.	2 1 11
12. Shale with ironstone, . . . . .	.	0 3	.	0 0 4
13. Coal,	0 5½	.	.	
14. Shale and ironstone bands and balls, . . . . .	.	0 4	.	0 1 0
15. Coarse ironstone balls, . . . . .	.	0 7	.	
16. Sandstone and shale,	Ft. in.	.	.	3 1 9
17. 1st Coal,—				
Soft,	1 0			
Splint,	2 0			
Shale,	1 5			
Soft,	1 10			
	<hr/>			
	6 3	4 10	.	0 1 5
18. Sandstone and shale, . . . . .	.	.	.	7 2 4½
19. 2d Coal, Pyotshaw Splint,	3 8	.	.	
20. Sandstone and shale, . . . . .	.	.	.	6 2 8
21. 3d or Main Coal,—				
Splint,	1 2			
Soft,	3 7			
	<hr/>			
	4 9	4 9	.	
22. Shale and sandstone, . . . . .	.	.	.	6 1 5½
23. 4th Coal,	3 0	.	.	
24. Sandstone and shale, . . . . .	.	.	.	7 0 0
25. 5th Coal,	3 9	.	.	

Dip of sections from 9th to 21st
inclusive, nearly SW.

Section XXII.—*Dalsiel Pit.*

1. 1st Coal,	6 0	.	.	
2. Sandstone and shale, . . . . .	.	.	.	7 0 0
3. 2d Coal,	2 6	.	.	
4. Sandstone and shale, . . . . .	.	.	.	14 0 0
5. 3d Coal,	3 10	.	.	

Dip easterly towards the Calder.

Section XXIII.—*Carfin Pit, Hattonhill.*

1. Alluvium and other rocks, . . . . .	.	.	.	12 0 0
2. 1st Coal, with a parting,	4 6	.	.	
3. Sandstone and shale, . . . . .	.	.	.	10 0 0
4. 2d Coal (Pyotshaw),	2 6	.	.	
5. Pavement, sandstone and shale, . . . . .	.	.	.	5 0 0
6. 3d or Main Coal,	3 9	.	.	

Section XXIII.—*continued.*

	Coal.	Ironstone.	Limestone.	Rocks.	
	Ft. in.	Ft. in.	Ft. in.	Fath.	ft. in.
7. Sandstone and shale,	.	.	.	10	0 0
8. 4th, or Humph Coal,	0 10	.	.	.	.
9. Sandstone and shale,	.	.	.	3	3
10. Shale, containing four or five thin bands of ironstone,	.	.	.	0	0
11. 5th or Splint Coal,	4 3	.	.	.	.
12. Fire-clay,	.	.	.	0 1	4
13. Coal,	1 0	.	.	.	.

Section XXIV:—*Journal of a bore at Whitchinch, the property of
James Smith, Esq. of Jordanhill.*

1. Earth,	.	.	.	.	0	6
2. Sand,	.	.	.	.	0	2 0
3. Clay, lamellated,	.	.	.	.	1	4 0
4. Mud,	.	.	.	.	5	1 0
5. Slaty sandstone,	.	.	.	.	0	4 9
6. 1st Limestone,	.	.	.	.	0	0 10
7. Slaty sandstone,	.	.	.	.	0	1 8
8. 2d Limestone,	.	.	.	.	0	1 7
9. Sandstone,	.	.	.	.	0	4 10 ¹
10. 3d Limestone,	.	.	.	.	0	0 8
11. Sandstone,	.	.	.	.	0	2 6 ¹
12. Slaty sandstone,	.	.	.	.	1	3 0
13. Shale, containing 9 inches of clay-ironstone,	.	.	.	.	6	4 0
14. Sandstone,	.	.	.	.	0	1 6
15. Slaty sandstone,	.	.	.	.	0	2 2
16. Shale,	.	.	.	.	0	1 11
17. 4th limestone,	.	.	.	.	0	1
18. Shale,	.	.	.	.	1	0 9 ¹
19. 1st Ironstone,	.	.	.	.	0	0 2
20. Shale,	.	.	.	.	1	3 6 ¹
21. 5th Limestone,	.	.	.	.	0	0 6 ¹
22. Shale,	.	.	.	.	0	3 0
23. Slaty sandstone,	.	.	.	.	0	2 0
24. Shale,	.	.	.	.	2	1 1
25. 2d Ironstone,	.	.	.	.	0	0 3 ¹
26. Shale,	.	.	.	.	0	3 5
27. 3d Ironstone,	.	.	.	.	0	0 6
28. Shale,	.	.	.	.	0	5 3
29. 4th Ironstone,	.	.	.	.	0	1 2
30. Shale,	.	.	.	.	0	2 4
31. 5th Ironstone,	.	.	.	.	0	1 0
32. Shale,	.	.	.	.	0	0 2
33. 6th Ironstone,	.	.	.	.	0	0 8
34. Shale,	.	.	.	.	0	3 4
35. 7th Ironstone,	.	.	.	.	0	0 9
36. Shale,	.	.	.	.	0	3 1
37. 8th Ironstone,	.	.	.	.	0	0 3
38. Shale,	.	.	.	.	0	0 11
39. Slaty sandstone,	.	.	.	.	0	5 11
40. Shale,	.	.	.	.	9	2 0
41. 6th Limestone,	.	.	.	.	1	0 3

Section XXIV.—*continued.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. m.	Ft. in.	Yath. ft. m.
42. Shale,	.	.	.	0 2 9
43. 7th Limestone,	.	.	.	0 1 8
44. Shale,	.	.	.	0 0 4
45. 8th Limestone,	.	.	.	0 0 3
46. Shale,	.	.	.	1 2 11
47. 9th Limestone,	.	.	.	0 3 0
48. Shale,	.	.	.	0 0 3
49. 10th Limestone,	.	.	.	0 3 6
50. Shale,	.	.	.	0 0 3½
51. 11th Limestone,	.	.	.	0 8 0
52. Shale,	.	.	.	0 0 4
53. Hard calcareous ditto,	.	.	.	1 4 6
54. Shale,	.	.	.	0 1 4
55. Hard calcareous ditto,	.	.	.	0 2 0
56. Shale,	.	.	.	0 0 11
57. Hard calcareous ditto,	.	.	.	0 1 9
58. Shale,	.	.	.	

Section XXV.—*Chapelhall Minerals.*

1. Alluvium,	.	.	.	20 0 0
2. Sandstone and shale,	.	.	.	3 0 0
3. Ell Coal,—	Ft. in.	.	.	
Splint and soft mixed,	3 0	.	.	
Coarse fine-clay,	2 6	.	.	
Soft,	1 6	.	.	
	—	4 6	.	
4. Sandstone and shale,	.	.	.	10 0 0
5. Pyotshaw Coal,	4 0	.	.	
6. Parting 5 to 18 inches,	.	.	.	0 0 6
7. Main Coal,	5 0	.	.	
8. Sandstone and shale,	.	.	.	13 0 0
9. 4th or Humph Coal,	1 0	.	.	
10. Sandstone and shale,	.	.	.	5 0 0
11. Splint Coal,	3 6	.	.	

NOTE.—The sections at Moffat, Ballochnie and Whiterigg so far correspond with that at Chapelhall, that I have not thought it necessary to quote them. At these collieries the Pyotshaw and Main Coals are connected, and form at Ballochnie a 11-feet or 12-feet coal.

Section XXVI.—*Garion Gull Minerals.*

1. Coal,	2 6	.	.	14 0 0
2. Sandstone and shale,	.	.	.	
3. Upper or thick Coal,—		.	.	
Free,	9 6	.	.	
Splint,	1 0	.	.	
	—	10 6	.	
4. Sandstone and shale,	.	.	.	17 0 0

Section XXVI.—*continued.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath. ft. in.
5. 1st or Ell Coal, wrought at Mar- lege—Splint,	1 6			
Free Coal,	3 0			
	— 4 6			
6. Sandstone and shale,				13 0 0
7. 2d or Main Coal, formerly wrought at Dalsarf, now at Shellyton, mixed Splint and Cannel,	5 0			
Dip SW.				

This section may be regarded as descriptive of the strata in the estates of Wishaw and Coltness, and in the parish of Dalsarf; as also at Quarter Colliery, near Hamilton.

Section XXVII.—*Bore at Bellside House, from the pavement of the Cleland Laigh Coal to the Drumgray Coal.*

1. Surface,	0 2 6
2. Faiks,	1 0 0
3. Hard rock,	0 2 0
4. Shale,	2 0
5. Faiks,	4 6
6. Hard rock,	0 3 4
7. Ferruginous sandstone,	0 0 8
8. Sandstone,	2 1 3
9. Dark shale,	0 2 0
10. Hard faiks,	1 0 0
11. Sandstone,	7 0 0
12. Dark rock,	0 1 4
13. Coal,	0 2
14. Hard faiks,	0 2 4
16. Shale,	0 1 8
17. Dark faiks,	0 1 6
18. Dark shale,	3 0 0
19. Ironstone,	0 2
20. Black shale,	0 0 3
21. Ironstone,	0 1 ½
22. Shale (black),	0 0 2
23. Ironstone,	0 1
24. Black shale,	0 0 9
25. Dark rock,	0 0 8
26. Black shale,	0 1 4
27. Hard rock,	2 2 0
28. Faiks,	0 1 0
29. Shale,	0 0 8
30. Coal,	3 6

Section XXVIII.—*Minerals from the Drumgray or 8th Coal to the 1st or Upper Limestone, as seen in Luchap Wutei, above Fairbank, and found in a bore made by Mr Roxburgh of Langside, parish of Shotts.*

	Coal.	Ironstone.	Limestone.	Rocks.	
	Ft. in.	Ft. in.	Ft. in.	Path. ft.	in.
1. Sandstone,				2	4 0
2. Drumgray Coal,	2	6			
3. Fire-clay,				0	2 0
4. Sandstone,				1	2 0
5. Shale and sandstone,				1	4 0
6. Coal,	1	0			
7. Shale, &c.				3	0 0
8. Calcareous sandstone,				0	1 0
9. Shale,				1	0 0
10. Sandstone and shale, with small ironstone nodules,		1	0		
11. Sandstone,				2	3 0
12. Micaceous shale,				0	2 0
13. Coarse ironstone,		0	2.		
14. Clay shale,				0	2 6
15. Coarse ironstone,		0	3		
16. Clay shale,				0	1 0
17. Coarse ironstone,		0	1		
18. Shale,				0	3 0
19. Good ironstone,		0	5		
20. Fire-clay, good, with ironstone balls,				0	6 0
21. Sandstone,				0	6 0
22. Fails,				0	3 0
23. Sandstone,				0	1 0
24. Shale with ironstone balls,		0	6		
25. Coal,—Soft, 1 ft. 6 in. Cannel 2 in.	1	8			
26. Calcareous sandstone,				0	0 8
27. Shale and sandstone,				1	2 0
28. Bituminous shale,				1	3 0
29. Sandstone,				2	3 0
30. Fire-clay,				2	1 0
31. Mussel-band ironstone,		0	6		
32. Coal,	1	0			
33. Fire-clay,				0	1 0
34. Slaty sandstone,				1	2 0
35. Sandstone,				0	3 0
36. Shale and sandstone,				1	0 0
37. Sandy clay-shale,				2	2 0
38. Clay-shale,				1	0 0
39. Coal,	0	9			
40. Fire-clay,				0	1 0
41. Slaty sandstone,				0	0 5
42. Fire-clay,				0	1 0
43. Ironstone nodules, good,		0	3		
44. Ironstone grey band,		0	10		
45. Coarse fire-clay,				0	4 0
46. Sandstone,				1	0 0
47. Slaty sandstone,				2	3 0
48. Sandstone,				0	4 0
49. Shale,				0	1 0
50. Slaty sandstone,				0	5 0
51. Shale and coarse ironstone band,				1	0 0

Section XXVIII.—*continued.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath ft. in.
52. Sandstone,	.	.	.	1 0 0
53. Shale and coarse ironstone,	.	0 2	.	1 0 2
54. Good ironstone,	.	0 5	.	1 0 0
55. Coarse fire-clay,	.	.	.	2 2 0
56. Sandstone,	.	.	.	0 4 0
57. Clay-shale,
58. Ironstone,	.	0 4	.	.
59. Coal,	1 3	.	.	.
60. Faiks,	.	.	.	0 4 0
61. Sandstone,	.	.	.	0 3 0
62. Coal,	0 6	.	.	.
63. Sandstone,	.	.	.	1 0 0
64. Coarse fire-clay,	.	.	.	1 2 0
65. Slaty sandstone,	.	.	.	2 3 0
66. Shale and small ironstone nodules,	.	.	.	2 4 0
67. Sandstone,	.	.	.	0 2 6
68. Shale,	.	.	.	0 2 0
69. Coarse ironstone,	.	0 4	.	1 2 0
70. Slaty sandstone,
71. Ironstone,	.	0 3	.	3 0 0
72. Slaty sandstone,	.	.	.	1 0 0
73. Clay-shale,	.	.	.	3 2 0
74. Slaty sandstone,	.	.	.	1 2 0
75. Coarse fire-clay,	.	.	.	15 0 0
76. Sandstone,

Bore to the Upper Limestones:

77. Hard blue sandstone, slightly calcareous,	.	.	.	0 1 6
78. Dark fine clay,	.	.	.	0 0 4
79. Grey faiks,	.	.	.	0 3 6
80. Fine white clay,	.	.	.	0 0 4
81. Dark fine clay,	.	.	.	0 4 0
82. Hard grey rock, of which 2 feet at the bottom, contained a portion of lime.	.	.	.	0 5 6
83. Dark blue shale, tinged with red colour and some ironstone ball,	.	.	.	3 0 6
84. Fine white fire-clay, full of ironstone balls,	.	.	.	1 3 9
85. Hard grey rock in beds, in which the test indicates a portion of lime with a good spring of water,	.	.	.	2 2 0
86. Shale,	.	.	.	0 0 9
87. Continuation of last described rock,	.	.	.	2 2 11
88. Dark shale,	.	.	.	0 0 6
89. Light coloured hard faiks,	.	.	.	0 1 0
90. White faiks and dark fire-clay,	.	.	.	0 3 6
91. Remarkably hard kinkle bandstone,	.	.	.	0 1 0
92. Beautiful white, apparently pipe-clay,	.	.	.	0 3 0

Section XXVIII—continued.

	Coal.	Ironstone.	Limestone.	Rocks:	
	Ft. in.	Ft. in.	Ft. in.	Fath.	ft. in.
93. Black sooty coal,	0 5				
94. Dark fire-clay,				0	1 0
95. Dark shale and faiks, tinged with a red colour, very full of sulphur,				0	1 0
96. Very hard fine grey rock, sulphury and limy,				0	4 0
97. Dark shale with light coloured faiks,				0	1 6
98. Very white fine grained hard rock,				1	2 0
99. Shale,				0	0 6
100. Continuation of last described free rock but softer, except a few inches at the bottom,				0	3 9
101. White fire-clay,				0	0 2
102. Hard white rock,				0	1 0
103. Grey shale,				0	0 4
104. Hard rock, partaking of the common qualities of the preceding ones, in being fine sulphury and limy,				0	1 3
105. Fine dark shale,				0	5 0
106. Very fine white stone,				0	0 7
107. Shale,				0	0 5
108. Remarkably hard kinkle bandstone,				0	0 9
109. White faiks, mixed shale,				0	1 0
110. Blue shale (sandy)				0	3 3
111. Remarkably hard kinkle bandstone,				0	0 10
112. Very finewhite faiks, and dark soft shale, and latterly some thin ironstone balls,				1	0 6
113. Dark grey shale with thin ironstone,				0	1 10
114. Remarkably hard kinkle limy rock,				0	1 0
115. White faiks and grey shale, very soft at the bottom,				0	5 6
116. Coal,	0 1				
117. Soft coarse grey rock,				0	1 0
118. Fine grey faiks and shale, tinged with red,				0	2 0
119. 1st Bastard greyhard limy stone,				0	1 6
120. Hard blue shale with grey faiks and some ironstone,				1	4 2
121. 2d Bastard limy stone,				0	1 0
122. Very hard dark fine shale, 4 inches at the bottom, very soft,				0	2 0
123. Very hard limy stone,				0	0 6
124. Fine dark shale with faiks,				1	4 0
125. 3d Bastard limy stone,				0	1 2

Section XXVIII—continued.

	Coal.	Ironstone.	Limestone.	Rocks
	Ft m	Ft in	Ft in	Path ft in
126. Shale,	.	.	.	0 0 1
127. Continuation of the above described,	.	.	.	0 1 6
128. Bituminous limestone,
129. Fine dark shale, with 2 inches of hard stone,	.	.	.	1 2 2
130. Fine ironstone,	.	0 2	.	.
131. Soft dark shale with faiks, and a strong spring of water,	.	.	.	0 0 4
132. Very fine white sandy rocks in beds, with occasionally partings of shale, and inclining towards the bottom to be faiky, but altogether full of lime,	.	.	.	3 0 1
133. Dark fine shale with ironstone,	.	.	.	0 0 2
134. 4th Bastard limy, sandy, answering well to the test,	.	.	.	0 5 10
135. Fine tough dark shale, with white faiks,	.	.	.	0 2 3
136. Very hard blue limy stone,	.	.	.	0 0 4
137. Shale as last described,	.	.	.	0 1 0
138. Ironstone,	.	0 2	.	.
139. Shale as last described, with more or less hard faiks,	.	.	.	0 2 1
140. 5th Bastard limy rock, 1st sample,	.	.	.	0 1 8
141. Faiks and shale, changing into shale,	.	.	.	0 4 2
142. Hard calmy limestone,	.	.	0 3	.
143. Faiks with partings of shale,	.	.	.	0 1 0
144. Lime shale at first a little faiky, but turning into pure shale, with small pieces of ironstone,	.	.	.	10 5 1
145. Pure limestone of excellent quality,	1 ft. 8 in.	.	.	.
Shale at parting,	0 6	.	.	.
Pure and excellent limestone as above,	2 7	.	4 3	0 0 6
146. Shale, fine blue and tough, with a little mixture of faiks,	.	.	.	0 1 8
147. Hard sandstone,	.	.	.	0 4 4

Section XXIX—*Coal Group. Carryside Minerals near Shotts Ironworks.*

1. Shale,	.	.	.	0 2 6
2. Ironstone band and nodules,	.	0 8	.	.
3. Bituminous shale,	.	.	.	0 0 4
4. Coal (Cleland Laigh Coal),	2 6	.	.	.
5. Shale and sandstone,	.	.	.	7 0 0
6. Coal (8th or Drumgray Coal),	2 0	.	.	.

See Section

Section XXX.—*Journal of Minerals seen below the Trap near Kirk of Skotts.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft m.	Ft m.	Ft m.	Fath ft. m.
1. Dark green shale,	.	.	.	6 0 0
2. Slaty sandstone,	.	.	.	3 0 0
3. Light fire-clay,	.	.	.	0 5 0
4. Ironstone (average)	.	0 8	.	
5. Coal,	1 9	.	.	
6. Light fire-clay,	.	.	.	0 4 0
7. Slaty pavement sandstone,	.	.	.	0 3 0
8. Iron shale,	.	.	.	0 3 0
9. Coal (smithy),	1 4	.	.	
10. Shale and faiks,	.	.	.	15 0 0
11. Hard sandstone,	.	.	.	4 0 0
12. Shale,	.	.	.	1 3 0
13. Smithy Coal,	0 9	.	.	
14. Faiks and Shale,	.	.	.	5 0 0
15. Two bands of ironstone (average),	.	0 8	.	
16. Cannel Coal,	3 0	.	.	
17. Sandstone and shale,	.	.	.	9 0 0
18. Coal,	1 4	.	.	
19. Sandstone with shale, containing ironstone balls,	.	.	.	20 0 0

Section XXXI.—*Benlue Minerals, Dip N.E.*

1. Alluvium, &c.	.	.	.	7 3 6
2. Coal,	1 6	.	.	
3. Soft shale,	.	.	.	0 0 4
4. Sandstone,	.	.	.	0 4 0
5. Shale,	.	.	.	0 1 6
6. Sandstone,	.	.	.	0 0 6
7. Shale,	.	.	.	0 3 0
8. Coal (splint),	3 8	.	.	

Sometimes 14 inches in thickness.

Section XXXII.—*Journal of a Boie to the Upper Limestone at Lathum Hill.*

1. Alluvium,	.	.	.	0 3 0
2. Shale,	.	.	.	0 4 0
3. Grey sandstone, soft,	.	.	.	0 1 0
White do. hard,	.	.	.	0 3 6
Do. do. soft,	.	.	.	1 1 3
4. Shale,	.	.	.	0 1 9
5. Coal,	1 3	.	.	
6. Grey faiks and shale,	.	.	.	0 0 5
7. Fire-clay with shale,	.	.	.	0 0 9
8. Fire-clay,	.	.	.	1 4 2
9. Grey faiks with shale,	.	.	.	0 1 4
10. Coal,	0 3	.	.	
11. Grey stone,	.	.	.	0 11 0
12. Black shale,	.	.	.	0 1 0
13. Grey faiks,	.	.	.	0 1 3
14. Shale,	.	.	.	0 1 6

Section XXXII.—*continued.*

	Coal.	Ironstone	Limestone.	Rocks.	
	Ft in	Ft in	Ft in	Fath	ft in
15. Grey faiks,				0	0 9
16. Shale,				0	0 8
17. Fire-clay,				0	2 10
18. Black shale,				0	1 9
19. Grey faiks,				1	0 9
20. Do. do. hard,				0	1 0
21. Black shale, soft,				0	3 0
22. Grey faiks,				0	1 0
23. Fire-clay,				0	5 0
24. Coarse fire-clay,				0	5 0
25. Shale,				0	2 0
26. Grey faiks,				1	2 3
27. Hard sandstone faiks,				1	3 8
28. Coal,	2	1			
29. Grey faiks,				0	4 0
30. Black shale,				0	1 10
31. Grey faiks,				0	3 0
32. White sandstone, hard,				2	1 6
33. Grey faiks,				0	4 6
34. Shale,				1	2 9
35. Grey faiks, very hard,				0	6 6
36. Shale,				0	1 3
37. Grey faiks do.				0	3 6
38. Grey sandstone do				0	5 3
39. Limestone,			4	6	
40. Shale,				0	5 1
41. Grey faiks,				0	6 9
42. White sandstone, do.				0	0 7

For a Journal from the upper to
the lower limestones, see Essay.

Section XXXIII.—*Bore at Blackhill, east of Glasgow.*

1. Surface, &c.				0	4 0
2. Blue sandy mud,				0	2 0
3. Blue stony channel,				0	4 9
4. Fire-clay,				0	2 10
5. Tull,				0	1 0
6. Grey faiks,				0	3 0
7. Shale,				0	4 0
8. Hard grey band,				0	0 5
9. Shale,				0	0 8
10. Soft shale,				0	0 9
11. Hard sandstone,				0	2 1
12. Bituminous shale,				0	0 5
13. Coal,	0	6			
14. Sandstone, (pavement),				0	0 4
15. Coal,	0	5			
16. Shale,				0	1 0
17. Shale,				0	1 6
18. Slaty sandstone,				0	1 6
19. Faiks,				0	1 9

Section XXXIII—continued.

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath. ft in.
20. Shale,	.	.	.	0 1 3
21. Slaty sandstone,	.	.	.	0 2 0
22. Coal,	2 2	.	.	.
23. Sandstone (pavement),	.	.	.	0 1 6
24. Grey slaty sandstone,	.	.	.	0 0 4
25. Shale,	.	.	.	0 3 1
26. White slaty sandstone,	.	.	.	0 2 1
27. Sandstone,	.	.	.	0 1 2
28. Shale,	.	.	.	0 4 7
29. Grey slaty sandstone,	.	.	.	0 1 5
30. Shale,	.	.	.	0 4 0
31. Sandstone and parting,	.	.	.	0 5 1
32. White slaty sandstone,	.	.	.	0 2 4
33. Hard white sandstone,	.	.	.	0 0 8
34. Soft parting,	.	.	.	0 0 3
35. Hard white sandstone,	.	.	.	0 2 8
36. Grey faiks,	.	.	.	0 4 2
37. Shale,	.	.	.	0 3 0
38. Hard grey stone,	.	.	.	0 0 0
39. Grey slaty sandstone,	.	.	.	0 2 4
40. Hard blue stone,	.	.	.	0 1 2
41. White fire-clay,	.	.	.	0 4 6
42. Hard blue stone,	.	.	.	0 1 2
43. White fire-clay,	.	.	.	0 4 6
44. Hard blue stone,	.	.	.	0 2 1
45. Hard grey faiks,	.	.	.	0 1 8
46. Shale,	.	.	.	0 1 2
47. Bituminous shale,	.	.	.	0 0 6
48. Soft black tull,	.	.	.	0 2 0
49. Shale,	.	.	.	0 0 10
50. Grey sandstone,	.	.	.	0 0 6
51. Grey faiks,	.	.	.	0 1 9
52. Sandstone (slaty)	.	.	.	0 2 0
53. Shale,	.	.	.	0 0 6
54. Coal,	1 9	.	.	.
55. Sandstone (pavement),	.	.	.	0 1 0
56. Grey faiks,	.	.	.	0 1 8
57. Shale,	.	.	.	0 5 0
58. Grey slaty sandstone,	.	.	.	0 3 10
59. Soft sandstone,	.	.	.	0 3 2
60. Shale,	.	.	.	0 1 4
61. Grey slaty sandstone,	.	.	.	0 3 0
62. Shale (mixed)	.	.	.	0 2 0
63. Grey slaty sandstone,	.	.	.	0 1 2
64. Bituminous shale,	.	.	.	0 1 6
65. Dark grey slaty sandstone,	.	.	.	0 0 8
66. Hard faiks,	.	.	.	0 3 0
67. Shale,	.	.	.	0 1 0

Section XXXIV.—*Bore in Glasgow Green.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath. ft. in.
1. Alluvium, &c.				22 4 6
2. Coal,	1 8			
3. Rocks,				5 3 10
4. Coal,	1 0			
5. Rocks,				2 2 3
6. Coal,	0 5			
7. Rocks,				5 1 6
8. Coal,	3 1			
9. Rocks,				0 6 0
10. Coal,	0 11			
11. Rocks,				7 3 9 $\frac{1}{2}$
12. Coal,	0 10			
13. Rocks,				
14. Coal,	1 4			
15. Rocks,				4 0 3
16. Coal,	0 7			
17. Rocks,				1 4 6
18. Coal,	0 4			
19. Rocks,				3 1 6
20. Coal,	1 0			
21. Rocks,				3 2 11
22. Coal,	0 5			
23. Shale with 2 inches of ironstone,	0 2			0 1 6

Section XXXV:—*Journal of a Bore in a Well on the North Side of Bed-
lay House.*

1. Depth of roan,				2 2 0
2. Hard sandstone,				0 3 4
3. Dark faiks,				0 4 8
4. Dark shale,				0 0 4
5. Dark faiks,				1 2 3
6. Dark fire-clay,				0 5 1
7. Fire-clay and sandstone,				0 2 9
8. Hard sandstone,				0 1 2
9. Sandstone,				0 0 5
10. Hard grey sandstone,				1 1 3
11. Sandstone,				0 1 6
12. Shale and sandstone,				0 5 10
13. Hard dougar band,				0 0 4
14. Sandstone and shale,				1 1 1
15. Hard dougar band,				0 0 4
16. Shale and sandstone,				0 3 11
17. Dark fire-clay,				0 2 3
18. Slaty sandstone,				0 0 5
19. Fire-clay,				1 1 7
20. Mixture of shale and fire-clay,				4 0 10
21. Do. with dark balls of ironstone,				0 5 10
22. Mixture of shale and fire-clay with balls of ironstone,				3 1 10
23. Dark shale and balls of ironstone,				1 0 6
24. Ironstone band,		1 1 $\frac{1}{4}$		

Section XXXV.—continued.

	Coal.	Ironstone.	Limestone.	Rocks.	
	Ft. in.	Ft. in.	Ft. in.	Fath. ft.	in.
25. Sandstone (pavement),				0 0	4½
26. Coal,	0 10				
27. Dark shale and faiks,				0 5	2
28. Dark faiks,				0 1	0
29. Very hard grey stone,				0 0	9
30. Dark shale,				1 0	10¼
31. Hard splint coal,	2 2				
32. Fire-clay and dark sandstone,				0 0	10½
33. Dark shale,				0 0	9

Section XXXVI.—*Journal of a Bore at Beulay, near the Railroad.*

1. From the surface to the bottom of limestone,	1	0	0
2. Shale,	1	0	6
3. Dark shale and coal,	0	1	2
4. Slaty sandstone and shale,	1	3	7
5. Coal, 0 8			
6. Dark hard fanks,	0	4	7
7. Coal, 0 9			
8. Slaty sandstone,	2	0	1
9. A kind of cannel coal, 1 4			
10. Slaty sandstone,	1	2	5
11. Hard grey sandstone,	1	5	0
12. Dark slaty sandstone,	1	5	0
13. Dark fire-clay,	0	5	3
14. Light sandstone,	0	2	8
15. Hard grey sandstone,	0	3	4
16. Light hard sandstone,	0	3	4
17. Indurated sandstone,	1	3	5
18. Slaty sandstone (very hard),	2	1	4
19. Fire-clay and slaty sandstone,	3	3	9
20. Shale,	1	5	11
21. Dark fire-clay, with balls of iron-stone,	6	0	7
22. Dark hard dougar,	0	0	6 1/2
23. Sandstone and shale,	0	0	10 1/2
24. Coal, 0 6			
25. Dark sandstone and shale,	1	5	4
26. Coal, 2 6			
27. Dark grey sandstone (pavement),	0	0	2
28. Hard slaty sandstone,	0	5	2
29. Fire-clay,	0	2	1
30. Hard slaty sandstone,	0	2	2 1/2
31. Hard band,	0	0	1 1/2
32. Grey slaty sandstone,	0	5	3 1/2
33. Hard-water whin,	0	1	3 1/2
34. Hard slaty sandstone,	0	1	2 1/2
35. Light fire-clay,	0	1	9 1/2
36. Slaty sandstone mixed with fire-clay,	2	5	11 1/2
37. Hard do. dark and fire-clay,	0	2	7

Section XXXVI.—*continued.*

	Coal.	Ironstone	Limestone.	Rocks		
	Ft. in.	Ft. in.	Ft. in.	Fath	ft	in.
38. Dark hard sandstone,	0	1	7½
39. Dark shale,	0	0	1½
40. Slaty sandstone and shale,	1	1	2½

Section XXXVII.—*Groeside Pit, Airdrie.*

1. Alluvium, . . . . .	.	.	.	.	8	0	0
2. Faiks, . . . . .	.	.	.	.	1	0	2
3. Sandstone, . . . . .	.	.	.	.	0	3	4
4. Faiky shale, . . . . .	.	.	.	.	1	0	6
5. Hard do. . . . .	.	.	.	.	1	3	4
6. Ironstone, . . . . .	.	.	0	4	.	.	.
7. Fine-clay, . . . . .	.	.	.	.	0	4	0
8. Hard shale, . . . . .	.	.	.	.	0	2	0
9. Sandstone, . . . . .	.	.	.	.	5	3	0
10. Shale, . . . . .	.	.	.	.	1	0	0
11. Keltongue coal,	3	6	.	.	.	.	.
12. Bores through sandstone and shale, . . . . .	.	.	.	.	6	0	0
13. Drumgray coal,	2	3	.	.	.	.	.

Section XXXVIII.—*Wilsontown.*

1. Sandstone, . . . . .	.	.	.	.	6	0	0
2. Faiks, . . . . .	.	.	.	.	0	3	4
3. 1st Coal,	1	8	.	.	.	.	.
4. Fire-clay, . . . . .	.	.	.	.	0	3	6
5. Faiks, . . . . .	.	.	.	.	0	4	6
6. Shale, . . . . .	.	.	.	.	0	3	4
7. Coal,	0	9	.	.	.	.	.
8. Shale, . . . . .	.	.	.	.	0	1	0
9. Coal,	0	3	.	.	.	.	.
10. Shale, . . . . .	.	.	.	.	0	1	9
11. Faiks, . . . . .	.	.	.	.	1	3	5
12. Fire-clay, . . . . .	.	.	.	.	0	4	7
13. Shale, . . . . .	.	.	.	.	0	1	0
14. Faiks, . . . . .	.	.	.	.	1	1	10
15. Shale, . . . . .	.	.	.	.	0	2	8
16. Coal,	0	8	.	.	.	.	.
17. Faiks, . . . . .	.	.	.	.	1	1	2
18. Shale, . . . . .	.	.	.	.	0	2	0
19. Coal (impure),	1	8	.	.	.	.	.
20. Shale, . . . . .	.	.	.	.	0	2	8
21. Faiks, . . . . .	.	.	.	.	1	5	8
22. Shale, . . . . .	.	.	.	.	0	3	4
23. Coal (clean),	2	3	.	.	.	.	.
24. Faiks varying from 20 inches to 14 feet. . . . .	.	.	.	.	.	.	.
25. Coal,	2	0	.	.	.	.	.
26. Brown sulphureous stone, . . . . .	.	.	.	.	0	0	6
27. Clean coal,	1	2	.	.	.	.	.
28. Sandstone, . . . . .	.	.	.	.	17	0	0
29. Shale, . . . . .	.	.	.	.	3	0	0
30. 1st Ironstone, . . . . .	.	.	.	0	2	.	.

Section XXXVIII.—continued

	Coal	Ironstone	Limestone	Rocks
	Ft in.	Ft in	Ft in	Path ft. in.
31. Shale,				0 1 6
32. 2d Ironstone,		0 1½		
33. Shale,				0 2 6
34. 3d Ironstone,		0 0½		
35. Shale,				0 2 0
36. 4th Ironstone,		0 0½		
37. Shale,				0 1 4
38. 5th Ironstone,		0 6		
39. Sandstone and shale,				10 0 0
40. Cannel coal,	1 4			

Section XXXIX.—*Carlisle Coal, &c.*

1. Alluvium and sandstone,				18 0 0
2. Shale,	Ft. in.			0 0 6
3. 1st Upper coal—soft	1 8			
splint, 0 4				
	2 0			
4. Clay shale,				0 0 2
5. Sandstone,				2 0 0
6. Under coal, with 4 inches of can-				
nel in the middle,	2 3			
7. Sandstone and shale,				11 0 0
8. Smithy coal (average),	2 0			
9. Sandstone and shale, and ironstone,				
(average),				16 0 0
10. Nethaufoot cannel coal,	1 3			
11. Sandstone and shale,				

For continuation of this Section
see Essay.

Section XL.—*Taken near Carlisle.*

1. 1st Under limestone,			3 0	
2. Shale,				0 3 0
3. Under limestone,			4 0	
4. A fathom or two below this lime-				
stone the following section ap-				
pears on the eastern bank of				
Rae's Gill.				
5. 1st Ironstone,		0 4		
6. Shale,				0 4 0
7. 2d Ironstone,		0 2½		
8. Shale,				0 2 0
9. 3d Ironstone,		0 2		
10. Shale,				0 4 0
11. 4th Ironstone		0 6		
12. Shale,				0 4 0
13. 5th Ironstone (irregular),		0 3		
14. Shale,				0 3 0
15. 6th Ironstone,		0 2		
16. Shale,				0 2 6
17. 7th Ironstone,		0 6		
18. Shale with nodules of ironstone,				1 0 0

Section XL.—*continued.*

	Coal.	Ironstone	Limestone.	Rocks.	
	Ft. in.	Ft. in.	Ft. in.	Fath	ft. in.
19. 8th ironstone,		0 3			
20. Black shale with ironstone nodules,			2	0	0
21. 3d Under limestone (foul part), Continuation of Section as seen at Braidwood, Harestanes, Lauchie- burn, &c.					
22. Clay and shale, with nodules,			1	2	0
23. Ironstone,		0 4			
24. Shale, with ironstone nodules,			1	4	0
25. Ferruginous limestone,			1	2	
26. Shale, containing 2 or 3 bands of ironstone,		1 8		1	0 4
27. Cathead argillaceous limestone,			0 3		
28. Limestone main-post,			5	0	

Section XLI.—*Craigengill Limestones.*

1. Ferruginous limestone,		2 2			
2. Shale,			1	0	0
3. Ironstone (irregular),	0 4				
4. Shale,			0	3	0
5. Ironstone (irregular),	0 2				
6. Shale,			0	4	0
7. Ironstone,	0 1				
8. Shale,			0	1	6
9. Coarse ironstone,	0 6				
10. Ferruginous limestone,		1 8			
11. Coarse limestone,		0 6			
12. Limestone main-post,		5 6			
13. Shale, containing nodules of iron- stone,			0	2	0
14. Coal,	1 6				
15. White clay,			6	0	0

Section XLII.—*Kilnclough Limestones.*

1. Shale, with 4 bands of ironstone,	1 4		2	3	0
2. Ferruginous limestone, containing many shells,		2 6			
3. Shale, containing heavy ironstone nodules and irregular bands,	2 0		2	1	0
4. Limestone main-post,		6 0			

Section XLIII.—*Kilpothall Limestone.*

1. Shale, containing 14 thin bands of ironstone,	1 0		2	2	0
2. Limestone,		4 6			
3. Coal,	2 6				
4. A little west of Kilpothall, at East Shield, the main-post is wrought, it rests upon 3 feet of coal. The same post is wrought at West Shield and Braes, 6 feet in thickness, resting upon—					

Section XLIII—*continual*.

	Coal.	Ironstone	Limestone.	Rock-
	<small>Ft. in.</small>	<small>Ft. in.</small>	<small>Ft. in.</small>	<small>Fath. ft. in.</small>
Coal,	2 2			
Fire-clay,				0 2 0
Hard sandstone,				3 2 0
Coal,	1 2			
Shale and sand beds,				

Section XLIV.—*Birniehall*.

1 Earth,				1 2 0
2 Coarse limestone,			1 8	
3 Shale, with encrinurites, &c.				0 2 0
4 Shale,				0 1 0
5 Ironstone,		0 2		
6 Shale, with ironstones,		1 0		1 5 0
7 Argillaceous limestone,			0 6	
8 Limestone,			4 3	
9 Shale, and ironstone bands,		1 2		4 0 0
10 Limestone main-post,			4 3	
11 Soft shale,				0 0 0½
12 Coal,	3 4			

Note.—The limestone coals increase eastward of Carluke, while the shales and ironstones decrease in thickness. There is almost a universal deposit of fine clay of great thickness, which may be turned to valuable account in the manufactory of earthenware, if not of porcelain; it is found of very superior quality at West Side-wood, the property of Mr Wilson, and also in the neighbourhood of Carluke.

Section XLV.—*Calderside*.

1 Faiks,				1 4 0
2 Coal,	0 8			
3 Shale,				0 0 3
4 Sandstone,				1 2 0
5 Shale,				2 3 0
6 Coal (Wilsontown Coal),	1 0			
7 Fire-clay,				0 3 0
8 Sandstone,				0 0 0
9 Shale,				0 1 2
10 Coal,	1 2			
11 Grey faiks,				1 0 0
12 Coal,	0 8			
13 Sandstone,				3 2 0
14 Faiks,				1 4 0
15 Shale, containing 9 bands of ironstone, from 3 to 5 inches each,		3 0		7 5 0

Section XLV.—*continued.*

	Coal Ft. in.	Ironstone. Ft. in.	Limestone Ft. in.	Rocks. Fath. ft. in.	
16. Ferruginous limestone,			0 10		
17. Shale,				1 2	0
18. Limestone,			1 2		
19. Shale,				1 3	0
20. Limestone,			2 3		
21. Shale,				0 3	0
22. Limestone,			4 0		
23. Sandstone,				1 4	0

Section XLVI.—*Calderside and Crossbasket Ironstones.*

1. Sandstone,				0 2	0
2. Shale,				0 4	0
3. Ironstone, No. 1,		0 6			
4. Shale,				1 0	0
5. Ironstone, No. 2,		0 7			
6. Shale,				0 3	0
7. Ironstone, No. 3,		0 1			
8. Shale,				0 5	0
9. Ironstone nodules, average,		0 3			
10. Shale,				0 3	0
11. Ironstone, No. 5.		0 7½			
12. Shale,				2 0	0
13. Limestone, inferior quality,			6 0		
14. Ironstone, No. 6,		0 3			
15. Shale,				0 2	0
16. Ironstone, No. 7,		0 3			
17. Shale,				0 1	6
18. Ironstone nodules, some of them very large, average,		0 2			
19. Shale,				3 0	0
20. Coal,	0 8				
21. Shale,				0 2	0
22. Ironstone, 10th or spotted band,		0 8			
23. Shale,				0 1	6
24. Ironstone, No. 11,		0 4			
25. Shale,				15 0	0
26. Sandstone,				0 1	2
27. Ironstone, No. 12,		0 6			

Section XLVII.—*Auchintiber Limework.*

1. Sandstone,				1 4	0
2. Shale, with a few ironstone nodules,				1 3	0
3. Limestone,			1 8		
4. Shale,				0 1	6
5. Limestone,			4 0		
6. Kingle band,				0 1	0
7. Coal,	0 1				

These three may be regarded as one continued section, taken from the fault below Newhouse Mill to Crossbasket. The same minerals from No. 10 of Calderside section crop out in the opposite direction, between Newhouse Mill and Rutherford Limework.

Section XLVIII.—*Hill of Dripps.*

	Coal Ft. in.	Ironstone, Ft. in.	Limestone, Ft. in.	Rocks Fath ft in
1. Shale,				
2. Ferruginous limestone,	.	.	1 0	
3. Limestone main-post, Dip SW.	.	.	7 0	

Section XLIX.—*Thornton.*

1. Shale,	.	.	.	0 2 0
2. Limestone,	.	.	2 6	
3. Shale,	.	.	.	1 3 0
4. Limestone, good quality,	.	.	9 0	

Section L.—*Ferryburn, above Glasgow Mill Bridge.*

1. Limestone, low bands,	.	.	1 8	
2. Shale,	.	.	.	0 0 10
3. Ironstone,	.	.	0 3	
4. Shale,	.	.	.	0 2 0
5. Ironstone,	.	.	0 3	
6. Shale,	.	.	.	0 4 0
7. Ironstone,	.	.	0 3	
8. Shale,	.	.	.	1 2 0
9. Ironstone (best),	.	.	0 10	
10. Shale,	.	.	.	1 0 0
11. Ironstone,	.	.	0 3	
12. Shale,	.	.	.	0 4 0
13. Limestone,	.	.	2 6	
14. Shale, containing 3 bands of iron- stone,	.	.	1 0	3 0 0
15. Limestone,	.	.	4 0	
16. Clay-shale,	.	.	.	0 2 0
17. Fire-clay,	.	.	.	1 2 0
18. Slaty sandstone,	.	.	.	0 4 0
19. Shale,	.	.	.	0 5 0
20. Coal,	1 8	.	.	
21. Fire-clay,	.	.	.	0 4 0
22. Shale, with ironstone nodules,	.	.	.	4 0 0
23. Limestone main-post,	.	.	6 0	
24. Fire-clay,	.	.	.	2 0 0
25. Sandstone,	.	.	.	3 0 0
26. Slaty sandstone,	.	.	.	1 0 0
27. Ferruginous limestone,	.	.	0 4	
28. Encrinal limestone,	.	.	1 6	
29. Clay-shale,	.	.	.	3 2 0
30. Sandstone,	.	.	.	4 0 0
31. Shale,	.	.	.	0 2 0
32. Clay-shale,	.	.	.	0 1 0
33. Chert,	.	.	.	0 4 0
34. Blue clay,	.	.	.	0 0 3
35. Ironstone (best quality),	.	0 9	.	
36. Shale,	.	.	.	0 2 0
37. Coarse ironstone,	.	0 3	.	
38. Shale,	.	.	.	1 2 0

Section L.—*continued.*

	Coal. Ft. in.	Ironstone. Ft. in.	Limestone. Ft. in.	Rocks. Fath. ft. in.
39. Large round balls of ironstone, from 3 to 12 inches diameter,	.	0 5	.	
40. Shale,	.	.	.	0 2 3
41. Ironstone,	.	0 3	.	
42. Shale,	.	.	.	1 4 0
43. Ironstone,	.	0 3	.	
44. Shale,	.	.	.	0 1 6
45. Ironstone,	.	0 4	.	
46. Shale,	.	.	.	1 4 0
47. Coarse fire-clay,	.	.	.	2 2 0
48. Sandstone,	.	.	.	0 4 0
49. Blue chert,	.	.	.	0 3 0
50. Coarse clay,	.	.	.	0 1 0
51. Blue chert,	.	.	.	0 0 3
52. Clay,	.	.	.	0 2 3
53. Blue chert, having the appear- ance of trap,	.	.	.	

This section comprehends the minerals seen in the Avon, from Farryburn to Coatcastle, and is the richest in ironstone I have seen.

Section LI.—*Ryclandside.*

1. Slaty sandstone and clay-shale, containing stems of <i>Lepidodendron</i> ,	.	.	.	3 2 0
2. Clay-shale,	.	.	.	1 0 0
3. Ironstone,	.	0 4	.	
4. Clay-shale,	.	.	.	0 2 0
5. Sandy clay,	.	.	.	0 2 6
6. Limestone,	.	.	2 6	
7. Foul limestone,	.	.	1 0	
8. Limestone,	.	.	12 0	
9. Shale, full of encrinites,	.	.	.	0 2 6
10. Limestone,	.	.	0 4	
11. Shale,	.	.	.	0 1 0
12. Shale, with 7 bands of ironstone,	.	2 0	.	2 1 0
13. Limestone,	.	.	0 8	
14. Coal,	0 3	.	.	
15. Fire-clay,	.	.	.	0 3 0
16. Coarse limestone (irregular),	.	.	1 0	
17. Chert,	.	.	.	0 3 0
18. Clay-shale,	.	.	.	0 1 0
19. Ferruginous clay-shale,	.	.	.	0 2 0
20. Blue chert (ferruginous),	.	.	.	0 3 0
21. Brown ferruginous clay-slate,	.	.	.	0 5 0
22. Blue do.	.	.	.	0 5 0
23. Clay shale (reddish),	.	.	.	

Section LII.—*Shabe Limework.*

1. Shale, with ironstone band,	0 6	2 0 0
2. Limestone,		9 0

Section LIII.—*High Drumclog.*

	Coal.	Ironstone.	Limestone.	Rocks.
	Ft. in.	Ft. in.	Ft. in.	Fath. ft. in.
1. Soil,	0 1 0
2. Clay,	0 4 0
3. Ironstone,	0 4	.	
4. Loose shale,	0 0 3
5. Ironstone,	0 5	.	
6. Shale,	0 2 0
7. Ironstone,	0 4	.	
8. Shale,	0 2 0
9. Ironstone,	0 4	.	
10. Shale,	0 2 6
11. Coal,	0 3	.	.	

Section LIV.—*Meadowfoot Lime-work.*

1. Foul limestone,	4 0
2. Good limestone,	8 0

These contain innumerable shells.

Section LV.—*Woodside Quarry, near Glasgow.*

1. Sandstone, . . . . .	.	.	1 0 0
2. Coal,	0 6	.	
3. Sandstone, . . . . .	.	.	0 2 0
4. Fire-clay, . . . . .	.	.	0 1 6
5. Sulphureous cannel coal,	0 6	.	
6. Shale, . . . . .	.	.	0 4 0
7. Sandstone, . . . . .	.	.	0 5 0
8. Coal,	1 4	.	
9. Shale, . . . . .	.	.	1 0 0
10. Cannel coal,	1 0	.	
11. Ironstone, . . . . .	.	0 5	
12. Shale, . . . . .	.	.	0 0 6
13. Sandstone, . . . . .	.	.	3 0 0
14. Coal,	1 2	.	
15. Ironstone, . . . . .	.	0 3	
16. Shale, . . . . .	.	.	0 4 0
17. Sandstone, . . . . .	.	.	0 4 0
18. Coarse fire-clay, . . . . .	.	.	1 4 0
19. Sandstone, . . . . .	.	.	1 0 0

Forty feet below this consists chiefly of shale.

Section LVI.—*Temple Pit, near Jordan Hill.*

1. Sandstone and shale, . . . . .	.	.	22 0 0
2. Soft coal,	2 0	.	
3. Dark shale, . . . . .	.	.	1 0 0
4. Sandstone, . . . . .	.	.	2 0 0
5. Coal,	1 8	.	
6. Shale and sandstone, . . . . .	.	.	16 0 0
7. Coal,	2 0	.	
8. Sandstone and shale, . . . . .	.	.	14 0 0
9. Coal, with 8 inches of cannel,	2 0	.	

These two last sections correspond with the Wilsontown and Carlisle coals, and below them rich limestones and ironstones cannot fail to be found. Four feet of ironstones have just been discovered in that neighbourhood, contained in thirty feet of shale. Indeed, it is my opinion that a great part of Dumfriesshire and Renfrewshire, as well as the county of Lanark, contains inexhaustible stores of these invaluable minerals.

REPORT ON DAIRY MANAGEMENT.

Although the processes of butter and cheese making are really simple and well understood, yet so many and various deviations from common practice have been introduced into them by the ingenuity and prolific invention of dairy maids, that some account of those deviations which had secured premiums for their practitioners should be given, before the means which led to success can be fully appreciated by other practitioners. It may be, that none of the minute deviations from usual practice were really instrumental in securing success; but when a particular course of practice is attended with success, when it may have rendered the injurious effects of a changeable climate and an inferior quality of pasture, uninjurious, it ought not to be overlooked. It will therefore be necessary to particularize the most successful instances of dairy management, and leave the reader to adopt that practice which he thinks will best suit his own particular case. And first, with regard to the making of

CHEESE.

Two competitions for cheese took place in the year 1832, —one at Inverary in the county of Argyle, on the 17th October, the other at Dumfries on the 31st of the same month. That at Inverary was for imitations of English, and at Dumfries for skimmed milk cheese. Six competitors appeared at Inverary, each producing three cheeses, and the conditions of competition were, that the quantity of cheese made by each should not be less than one hundredweight, and that the

cheeses produced should be a fair sample of the stock ; the attestation to be confirmed by oath if required.

The first premium was awarded to Mr John Lorne Stewart of Glenbuckie, for the best imitation of double Gloucester cheese, and the second to Mr Peter Harvie of Glenfinnart Farm in Cowall, Argyleshire, for the best imitations of Stilton and North Wiltshire cheeses. The judges * were so extremely well pleased with the other specimens of cheese produced, that they divided a small sum amongst the unsuccessful competitors ; but what struck them most forcibly, was an excellent imitation of Cheshire cheese, for which particular kind no premium had been offered, as in all former competitions the competitors had never succeeded in making a good imitation of Cheshire cheese. This specimen was produced by Mr James Cringan of Ballimore, and the judges gave him a small gratuity as a mark of their approbation of his success.

Mr Harvie affords this information of his method of making imitations of English cheeses, and of his general dairy management. " Our dairy " he says " consists of twenty-four cows, the milk of which is partly converted into rich and plain cheese, and partly into butter, as the state of the market for either commodity requires. We have in some seasons sold 250 stones of rich cheese, in which case less butter has been made. With regard to dairy management, cleanliness is the great requisite. The milk-house should be always clean, free of smell, and so constructed as to admit a current of air to circulate freely through it, and at the same time to be regulated at pleasure. The utensils employed should always be kept clean, and free from acidity. The cheese-house should be kept at the regular temperature of 70° Fahrenheit throughout the whole season of cheese-making, and the different processes of this manufacture should be executed without delay. I conceive it quite impossible to produce cheese of fine quality and taste without the use of the thermometer.

* They were Sir John P. Orde of Kilmoiey, Mr Campbell of Melfort, Mr McDougal of Gallanach, Mr Campbell of Inveraw, Mr McLaine of Lochbuy, and Mr Campbell of Dunstaffnage.

"Double Gloucester cheese is made from milk as taken from the cow, carefully put through a strainer into a tub of sufficient size for the cheese to be made. In the extreme of summer heat, the milk from the cow may be found too warm. It will be so, if above 94°, but the temperature may be easily brought down by the addition of cold skimmed milk. The rennet is then applied, and if good, the curd may be expected to coagulate in 20 or 25 minutes. The whey is taken away with a skimming dish, and the curd pressed with the hand until it becomes firm. The curd is then broken down with a double cheese-knife, and put into a drainer with a gentle pressure above it. The curd is improved by washing with boiling water instantly drained off. The curd is then broken down as small as possible, salted, wrapped in a cloth, put into the cheese-vat, and sent to the press. The cloth is regularly changed until it remains dry under the press, which is the only criterion to shew when the curd is sufficiently pressed. With the most expert cheese-makers, it may happen, that whey remains in the centre of the curd, which, if not quickly observed and removed, will crack and deform the cheese. An experienced person can detect this fault at an early stage, and by applying for a short time the cheese over the steam of a boiler, the whey will ooze out, and by the immediate application of the press, it may be all squeezed out. After the pressing is over, the cheese should be laid on a dry shelf, with a little fog or meadow-hay under it to expedite the extraction of damp. The cheese should be turned daily, and well rubbed with a dry cloth, but after getting firm, once a-week will be sufficient. It will be found a great convenience to have a spare press, and cast-iron presses are far preferable to others, as the pressure can be regulated in them at pleasure.

"Stilton cheese is made by mixing the evening's cream with the morning's milk, in the proportion of one gallon of cream to three gallons of sweet milk, and treated as above.

"Wiltshire cheese is made with new milk and cream, in the proportion of one quart of cream to two gallons of new milk, and treated as above."

In the competition of skimmed-milk cheeses, at Dumfries, it was resolved, on the 30th May 1832, by the Committee of Members of the Society, to make this condition, which was publicly advertised, that "the milk from which the cheeses to be exhibited for the premiums is to be made, shall have stood

at least twelve hours before being skimmed." Six competitors appeared, bringing with them six cart-loads of cheese. On examination by the judges, who were Mr Thomas Orr of Rosehall, and Messrs M'Harg and Robertson in Dumfries, —Mrs Janet Mackay, Dinwoodie Green, parish of Applegarth, was found entitled to the first prize; Mr William Niven, Barnmuir, parish of Closeburn, to the second; and Mr John Rodan, Foregirth, parish of Kirkmahoe, to the third.

Mrs Mackay's method of making skimmed-milk cheese is this: —"The cheeses were made from skimmed milk, one-half of which had stood 24, and the other half 12 hours, when both were carefully creamed, and one-half heated to the degree that will make the whole the requisite temperature. The milk when thus prepared receives the *steep* or rennet. A gill of rennet, made from a calf's stomach, will be sufficient for a quantity of milk that will make a cheese of 40 lb. After the rennet is put in, the milk must stand until it be all properly curdled. The curd is then broken very small with a skimming-dish, and allowed to settle down until all the whey be taken away; it must then be cut with a knife in a drainer, and allowed to remain in it until properly cooled. The curd must then be put into a vessel, and cut very small with a curd-knife, and a small quantity of salt used; it is again put into the drainer a second time, and allowed to remain there with a weight upon it for the space of an hour. It is again taken out of the drainer, put into a vessel, well washed, and the requisite quantity of salt added. It is then put into a cloth, then in the cheese-vat, and lastly in the press, and the cloth removed thrice a-day until the curd is properly pressed into a cheese."

Mr Niven takes the first milking from the cows at seven in the morning, and the second at seven in the evening, and next morning at six both are neatly creamed, and put into a boiler to warm, and searced through a coarse cloth into a tub. He allows the whey to drain off *slowly* from the curd after it has been coagulated by the rennet. He permits the curd to remain in the drainer, which is only *once* used, with a light weight upon it for *two* hours.

Mr Rodan, on taking the milk from the cows, puts it into earthenware dishes, containing not more than an imperial gallon each. The milk is warmed to the temperature it had when taken from the cow.

Although not a competitor at Dumfries, we may here insert the particulars of the method of making skimmed-milk cheese by Mr James Sime, Kilnmauchley, to avoid repetition elsewhere. Mr Sime takes milk from the cows three times a-day, at 6 A.M., 12 noon, and 8 P.M. The milk is put into wooden vessels until 7 the next morning, when it is skimmed and warmed for the rennet; but the evening's meal is kept till that time next morning. Great care is used not to let the milk be warmer than when it comes from the cow, as the cheese will become hard. After being deprived of the whey, the curd is allowed to stand for a day or two, when it is pressed for four or five hours, before being worked and salted. The cloth is changed twice a-day when the cheese is in the press, which may generally be for two days; but in August and September, when the curd is softer, it is pressed for three days. The cheeses are not allowed to dry too fast; and in dry weather they are covered with a cloth, to prevent cracking. They are turned and rubbed with a coarse cloth twice or thrice a-week; and afterwards in a drier place, they are turned and rubbed only once a-week, until fit for sale.

At the great show of the Society at Ayr in October 1835, a competition for cheese took place, when the first premium for sweet or full-milk cheese was awarded to Mr David Dickie, Tannacrieff, parish of Fenwick, Ayrshire. His process he thus describes:—"The farm consists of about eighty-four acres, mostly arable. Only one-fourth of the land is allowed to be in tillage at one time. He is able to send to market, averaging one year with another, about 300 stoncs of cheese, of the same description and quality as those which obtained the premium.

"The milk is put into a large tub, every lawful morning, to be curdled. The morning meal of milk is taken at once from the cow to the tub. The evening meal is first put into a boiler, and raised to the

same degree of heat as when newly taken from the cow, or perhaps to a higher degree, according to the state of the weather. The strength of the rennet is next ascertained, and as much of it put into the tub as is necessary to curdle the whole milk of the two meals in half an hour, or in rather less time. Then, having drained off the whey, the curd is put into a dipper as quickly as possible, and cut ten or twelve times successively before noon. It is next cut into small particles, salted, covered with a cloth, and put into a mould or cheese-vat. The cloth is changed twice the first day, and the mould is also placed before the fire and heated a little. After the first day, the cloth is changed every three hours during day-time, until the cheese is quite dry. The cheese is then taken out of the mould and placed in a dry loft. It is carefully turned and rubbed with a cloth once every day. Throughout the whole process, the principal object is to pay particular attention to keep every thing clean and neat."

The following memorandum contains the method of making imitation Single Gloucester cheese practised by Mrs Lumsden, Braco, who offered cheese of that description for competition of the Society's premium at Keith, on the 18th November 1834. The cheese was made on and after the 1st September, and taken out of a quantity, made during that season, of 4 cwt.

"When the newest of the milk from which the cheese is to be made is eighteen hours old, the quantity required for the cheese, being about sixty Scots pints to the cheese of one stone imperial, is skimmed and put into a tub: it is brought to the temperature of about 85°: the rennet and colouring are then added. When the curd has formed, the whey is taken from it. It is then put into a drainer, where it is allowed to stand for perhaps an hour or two until the whey drips from it. It is then cut with a knife, and some boiling water poured over it, occasionally stirring up the broken curd that it may get equal benefit of scalding—(about two pints of boiling water is used for the one-stone cheese). The salt is then strewed in and mixed with the curd; after which it is put into the cloth and cheese-vat, and put to press. The cloth is changed twice or thrice a-day, until it is found that it does not wet the cloth. It is then put into a cool place for about ten days, where it is turned twice a-day; after which it is put into a cheese-rack, and turned once a-day, as long as seen necessary, or until it is firm; and while it is in the rack, it is occasionally washed with warm whey."

Some time ago, a communication was sent to the Society from the Dowager Lady Carnegie of Southesk, through the intervention of Lord Greenock, on an experiment made by her Ladyship many years ago, at Kinnaird in Forfarshire, in order to imitate Parmezan cheese, from the account of the process related by the late Arthur Young, in the 7th volume p. 302 of his *Annals of Agriculture*. The reader is referred to that work for a minute description of the process which was witnessed by Arthur Young in Italy. Her Ladyship remarks in reference to the success of her experiment:—
“ I think Young says they use skim milk in Italy, and recollect that I gave two-thirds of new milk to one of skimmed milk, which I thought must be quite necessary, when I recollected the difference between our pasture and the plains of Lombardy. The cheese I made was not like the richest Parmezan, but its appearance and taste were such as to make it pass for Parmezan, though not of the first quality, and it certainly was quite different from cheeses made in the usual way.

“ When the experiment was made at Kinnaird, it was found that 303 quarts (two-thirds of which was new milk) yielded 50 lb. of cheese resembling Parmezan, whereas from 80 quarts of milk of the same quality made in the usual way, 19 lb. of cheese were obtained. Both cheeses were made towards the end of September, and were weighed a fortnight afterwards when sufficiently pressed. Thus it seems to require above 6 quarts of milk for 1 lb. Parmezan, while little more than 4 quarts made 1 lb. of common cheese. I cannot account for its requiring nearly a-third more milk, unless it is that I may have broken the curd too much.”

BUTTER.

A competition of butter for the Society's premiums took place at Charlestoun of Aberlour, on the 26th October 1832. Mr Grant of Ballindalloch was Convener of the Committee of Members, who, with the assistance of Messrs William Cantlie, Dufftoun, John Grant, Mains of Thirdills, and Peter Taylor, Aberlour, considerable dealers in butter, proceeded to inspect the different parcels offered in competition, and awarded the premiums as follows:—First, to Mrs Macpherson, Gorbity, parish of Rothes, county of Elgin, for 5 cwt.

28 lb. made and cured for sale on said farm during the season 1832. The second to Mrs Macinnes, Dandaleith, parish of Rothes, for 14 cwt. 72 lb. The third to Margaret Proctor, Ardcanny, parish of Rothes, for 5 cwt. 98 lb.; and the fourth to Mr Alexander Grant, Pitcharsh, parish of Inveraven, county of Banff, for 7 cwt. 56 lb. The smallest quantity that could be exhibited according to the conditions of competition was 5 cwt. According to the opinions of the judges, the butter produced for competition was, in general, not inferior to the best Dutch butter.

Mrs Macinnes's method of making and curing butter is the following:—"Earthenware vessels used for keeping the milk, and placed in the dairy on cool stone-shelves. The milk allowed to stand twelve hours, after which the cream is taken off and put into earthen jars, and made into butter the following day. The butter when made, clean washed with spring water, and half an ounce of fine salt given to every pound of 16 ounces. It is then kept covered up with a cloth, as it accumulates for four or five days, when it is all worked together, and another half ounce of salt added to every pound, and packed into the vessel that is to contain it, with a wooden mallet made for the purpose. A little salt is sprinkled over the top, which is covered closely up so as to exclude the air as much as possible."

Mr Grant keeps his milk and packs his butter in wainscot dishes and casks.

A competition was held for the Society's premiums at Kirkwall in Orkney in 1835. The accounts given of the making and curing of butter, by Thomas Mackenzie, Esq. of Groundwater, who occupies the farm of Lingro, and Mr John Hadden of Stenso, who both obtained premiums, differ so little from that already quoted, it is here unnecessary to repeat the process. Mr Mackenzie states that in his dairy, which stands in an airy situation, and into which no one is allowed to enter but the dairy-maid herself, great attention is paid to cleanliness, all the vessels, which are made of oak, being always scalded in hot water or steamed when used.

At Lerwick in Shetland, a competition for the Society's

premiums took place on the 9th November 1837. As the process of butter-making is so much alike, we shall only notice those particulars which seem to be peculiar to the practice of each of the competitors who obtained a premium. Mr John Edgar of Setter Farm, Isle of Brassay, keeps six cows, which are mostly fed on coarse natural grasses, and churns the cream four times a-week ; but in the end of summer, when the milk is richer, he churns the whole milk. He washes the butter well with spring-water, beating it on the bottom of the oak tub, until no appearance of milk is left in the smallest piece. The beating is conducted in wood, for the hand injures the appearance of the butter. He conceives the great art of butter-making to consist in the churning. When the weather is warm, the churn ought to be kept in a cool place, and considerable labour bestowed, in order to have the butter as short a time as possible amongst the milk. Should the milk become too warm, a little cold spring-water should be added, without lessening the labour, to prevent the butter getting too soft. He conceives no butter should be made for spring use after the cows get turnips.

Mr Joseph Leisk, of Uya, makes his butter from cream and milk, because he considers it only practicable in large dairies to make butter from cream alone. The milk is put into oaken vessels that hold each one milking, of about eight gallons imperial, which is left undisturbed for four or five days until churned. It is necessary that the milk be actually *soured*, not merely thickened, otherwise it will not part with all the butyraceous matter ; but it should be soured by natural and not artificial means, by letting it stand a sufficient time. Two or more milkings may be churned together, provided they are not mixed but in the churn. It is necessary to add warm water to raise the temperature to 70°, which, if the milk do not attain, all the butter will not be extracted from it. The water should be poured in by a funnel whilst the churning proceeds. The butter is first packed in stone-

ware dishes, and afterwards in wooden kegs. This second packing gives an uniform colour and taste to the butter. Coolers, Mr Leisk conceives, to be an unnecessary expense, besides, the agitation in the vessels is injurious to the milk before the churning. Cleanliness in the utensils and dairy is essentially necessary.

Mr William Merrylees of Gremista says, that his farm is of considerable extent, chiefly of hill pasture, suitable for the rearing of shecp. About thirty acres are enclosed, and have been regularly cropped, one-third being under green crop and pasture, upon which latter four cows are kept in summer, and four or five more on the hill pasture. The quantity of milk produced by the cows which are fed on artificial grasses is much greater than that obtained from those kept on the hill; but the quality of the latter is much superior to that of the former, and yields considerably more cream. The milk is kept in stoneware dishes. He considers August the best butter month, both in respect to quantity and quality. Butter of the best quality is produced when the cream is about 56° Fahr., when churning it rises to 60°, if above that, it will be soft. When the butter is taken from the churn, without being washed, it is beaten with the hand till it is completely cleared of the milk. One pound of fine salt is allowed to the stone of 14 lb. of butter. The butter is laid aside for two days, when it is again broken down and beaten with the hand, and packed into small jars for family use.

Mr Jeremiah Linklater, Walster, parish of Tingwall, describes his farm as being of inferior moss soil, and only part of it is cultivated. His cows, six in number, are fed on a part of the cultivated land, laid down into two years' lea, morning and evening, and at mid-day on the uncultivated part. But, although the farm does not yield a large quantity of butter, as from fine grass, yet both the milk and butter are admired for their fine flavour. He works his butter free of the milk in cold water, with a horn spoon. The quantity of butter cured by him during this season was 261 lb.

DESCRIPTION OF A DOUBLE-HEADED FANNER. *By Mr DOCKER, of Findon, Banffshire.*

THE improvement in the fanners, which has been brought before the Society by Mr Docker of Findon, appears to have been introduced by him so long ago as 1831; and, since the introduction of the improved shakers to the thrashing-machine, the usefulness of the improved fanner has become more extensive, since it has been found an almost essential accompaniment to the shaker.

It has been known to many mill-wrights that the common fanner, as applied to the thrashing-mill, is deficient in breadth for the due performance of its duty, especially in very powerful mills; but, in attempting to extend the breadth, it had been found that a deficient blast was the result, owing, as was supposed, to the difficulty of supplying a wide fan with a full supply of air. To obviate this difficulty has been the object of Mr Docker, and the result of his investigations has been the adoption of the *double-headed* fanners.

The annexed cut, Fig. 1, shews a plan, or horizontal

Fig. 1.

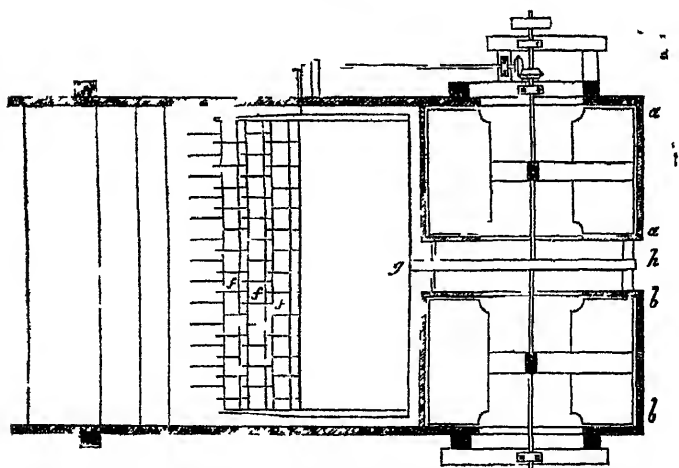
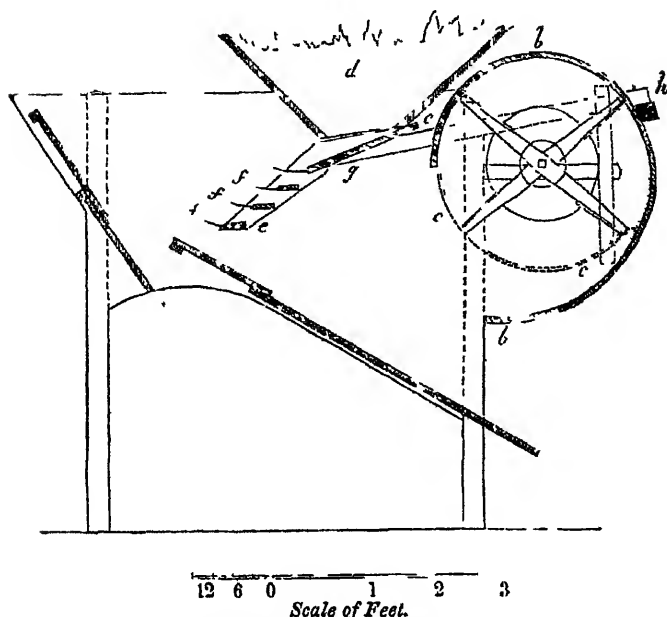


Fig. 2.



section of the fanners, and Fig. 2 a vertical section of the same; the letters refer to corresponding parts of both figures. Fig. 1 represents a mill fanner of 4 feet in width, *a a* being the one head, and *b b* the other, leaving an open space between the heads of 8 inches in width, extending over nearly two-thirds of the circumference of the head, for the admission of air to supply the two internal eyes. The dotted arc *c c*, Fig. 2, is that part of the space closed with boarding, to prevent the air entering to the eyes, from mixing with the blast. The two heads thus formed are covered in the common way with thin boarding inclosing the separate fans; there are set upon one axle which passes through both heads, and, by the arrangement of the parts, are each supplied with air through two eyes, each fan having an external eye, and one internal, open to the space which has been formed between the heads. In Fig. 2, *d* is the great mill hopper broken off, *e e* is the shoe upon which the grain and chaff are received. In

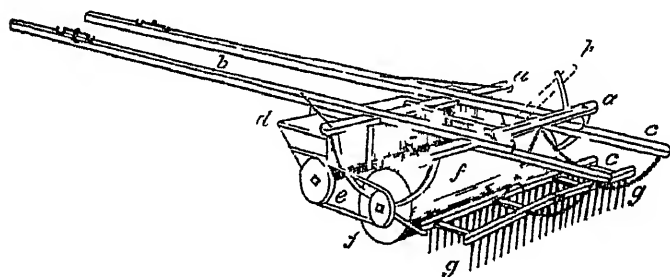
Mr Docker's practice the shoe in mill fanners is made as here represented, in which, besides the usual sole, an extension of the sides of the shoe is directed downwards, carrying three cross bars *fff*, which are armed with spikes of 6 inches in length. The opening between the heads admits of a lengthened arm *g* being attached to the shoe, and extends backward to the cross bar *h*, upon which the shoe and arm vibrate as a centre. By thus removing the centre of motion to a greater distance than usual, the shoe is supposed to operate better, its vibrations approaching more to a parallelism. The motion of the shoe is produced by a crank, which may be done either as represented here with mitre wheels, or in the manner usually adopted in other districts of the country. It will be observed that Mr Docker forms the case of the fan or head in the curve of a volute, which is supposed to give more effect to the blast than when the case is concentric with the fan. He recommends the fan to be 32 inches diameter, and to make 212 revolutions per minute; the diameter of eye to be 16 inches, or half the diameter of the fan, and that the sectional area of the wind passage taken at the sole of the shoe should be equal to the aggregate area of all the eyes. In the figure the area of all the eyes is 764 square inches, and the area of the wind passage, deducting obstructions, amounts to a little more than this. The shoe, as represented in the figures, is supported at the extremity of the sole on two very slight iron rods, one at each side of the shoe; the lower and upper ends of these rods are set loosely in sockets, and allow the shoe to vibrate freely, but the same may be effected by suspension in the common way.

DESCRIPTION OF A GRASS SEED SOWING-MACHINE. *By Mr DUDGEON, Broomhouse, East Lothian.*

This machine, of which a model was lodged by Mr Dudgeon about twelve months ago in the Society's Museum, is an amplification of the common broadcast sowing-machine, so

frequently used for sowing grass seeds, as well as for its legitimate purpose—the sowing of the different kinds of grain. Mr Dudgeon seems to have devoted his attention to the construction of a machine, adapted to perform the processes of sowing, then rolling, and, lastly, harrowing at one operation; and he has been the first to bring such a method before the Highland and Agricultural Society. The machine, at full size, has been certified to perform these combined operations in a satisfactory manner.

In the annexed cut, this compound machine is exhibited in perspective, wherein the combination of the harrow and the roller are detailed along with the sowing apparatus, and may be shortly described as follows;—*a a* are the fore and

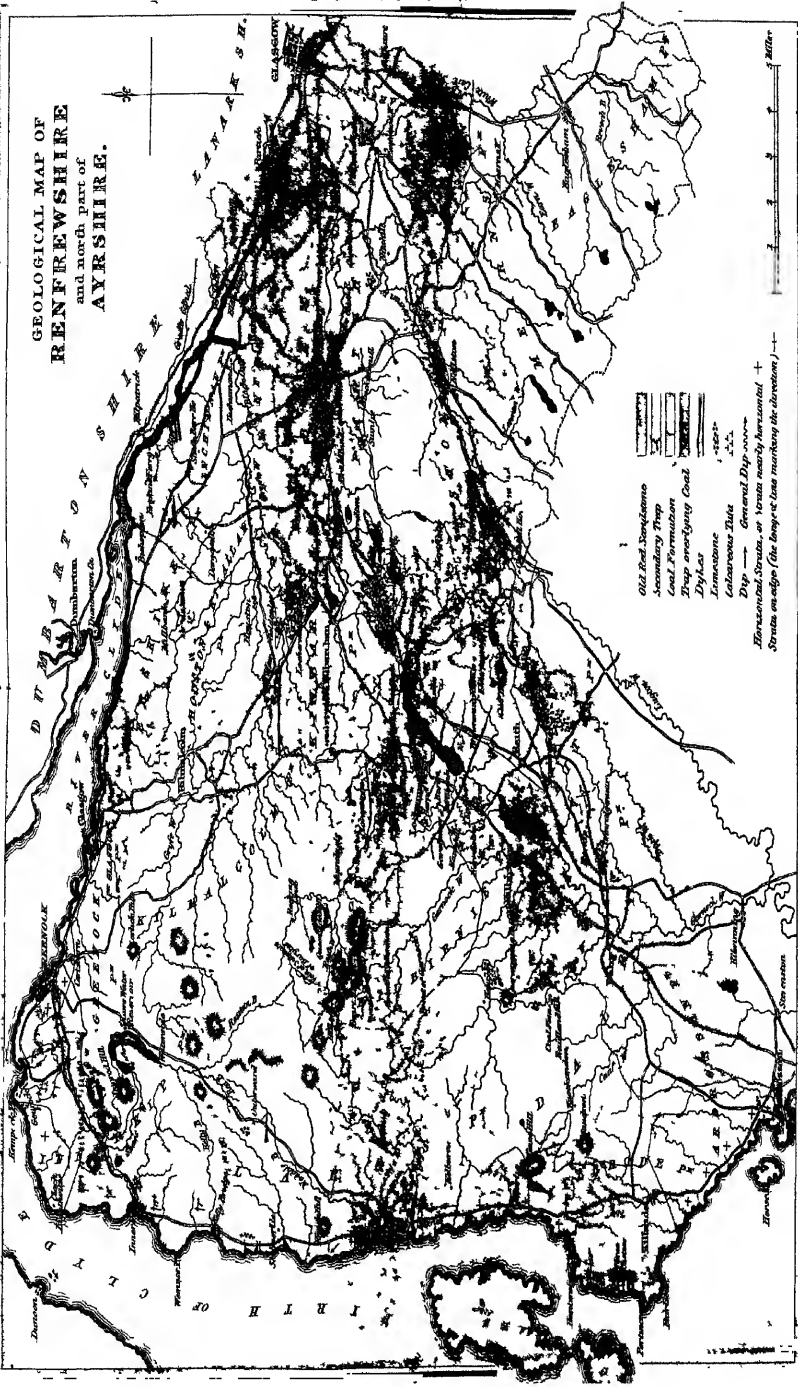


hind bars of the top frame set at the distance of 2 feet apart, their length being about 7 feet 4 inches. To these are bolted down the horse-shafts *b* of the ordinary length, but having in addition, the extension bars *c c* bolted to the end of the shafts. The seed-chest *d*, 6½ feet in length, is appended to the lower side of the horse-shafts, immediately in front of the fore-bar, and may be fitted up in all respects similar to the common broadcast seed-chest, the spindle which carries the small discharging toothed wheels being put in motion by a belt or a chain passing over a pulley *e*, 12 inches in diameter, on the projecting end of the spindle; the belt or chain receiving its motion from another pulley of 9 inches diameter, placed on the axle of the roller, now to be described. The roller *ff*

which is also $6\frac{1}{2}$ feet in length, is about 18 inches in diameter, though this is not imperative, nor is the material of which it is made of any essential importance. The roller is supported by its journals in two semicircular bars of malleable iron, or they may be of cast iron, bolted to the extremities of the fore and hind bars *aa*. From the semicircular bars proceed also two stays for the further support of the seed-chest. The harrow *gg* is suspended immediately behind the roller; it consists of two frames, each $3\frac{1}{2}$ feet in length, and 1 foot in width. These are jointed end to end, forming a harrow 7 feet in length, having only two rows of tines. The tines are set at $2\frac{1}{2}$ inches distant, and, as the tines of the one row alternate with those of the other, they will make a rut at every $1\frac{1}{2}$ inch. The direct suspension of the harrow is effected by means of chains from the movable bar *h*; this being jointed at the one end is capable of being raised from the horizontal position to the position *h*, or to any intermediate point, and retained there by a pin passed through a quadrant over which the bar moves; by this means the harrow is regulated as to depth, while by means of a link from the semicircular bars, and by the chain from the extremity of the extension bars *cc*, it is duly stayed in a proper position, while it has sufficient freedom of swing to insure its useful effect. The joint at the middle of the harrow allows it to accommodate itself to the rounding of the ridges when required. The lever seen in the middle of the top frame is, through its connection with another lever on the back of the seed-chest, used for opening and shutting the orifices, and for regulating the discharge of the seed, by moving a long slide plate in the usual manner.

It may be remarked of this machine, that the particular succession here shewn, that is to say *sowing, rolling, harrowing*, is not considered essential to its success; and that any other, as *rolling, sowing, harrowing*, may, under different circumstances of soil and management, be found equally successful.

GEOLOGICAL MAP OF RENFREWSHIRE and north part of Ayrshire.



- Old Red Sandstone
- Secondary Trap
- Local Formations
- Trap overlying Coal
- Dykes
- Carboniferous
- Carboniferous Tuffs
- Dip — General Dip —
- Horizontal Strata, or Strata nearly horizontal +
- Strata on edge (the longer it leans towards the direction) —

Scale 1:50,000

OUTLINES OF THE GEOLOGY OF RENFREWSHIRE AND THE
NORTH OF AYRSHIRE. *By WILLIAM MONTGOMERY,
Esq. younger of Cloak ; Factor, Castle Semple.*

[Twenty-five Sovereigns.]

AN account of the geology of Renfrewshire would be unsatisfactory which did not include the north of Ayrshire, from Ardrossan to Kelly Bridge on the one hand, and from Ardrossan to Caldwell House on the other. Renfrewshire and this district of Ayrshire form part of the same secondary series, including, upon the south, part of the great coal-field of Scotland, which, with interruptions of greater or lesser magnitude, extends from the Frith of Clyde to the German Ocean.

The county of Renfrew contains about 240 square miles, and the part of Ayrshire referred to about 150. The following observations will be made as short as possible, not being intended to embrace every minor detail, but only to convey a distinct general idea of the geological structure and phenomena of a tract of country, not less interesting in this respect than from the variety of its surface and beauty of its scenery. The author is anxious to give a correct general view of the geology of the whole district, but feels it impossible to dwell upon mineralogical details—which would not be exhausted in a large volume. And even in particulars more strictly geological, he is fully sensible that blanks must yet remain to be filled up. A correct and circumstantial account of the coal-fields of this district would be very interesting. At present no such account could possibly be given. While *something* is known regarding them, many more facts must be disclosed, and observations made to render that knowledge even nearly complete. It would be very desirable that the attention of geologists should be turned to this hitherto almost unnoticed district.

Nine-tenths of the water of Renfrewshire flows to the Clyde by the united streams of Black Cart, White Cart, and Gryfe. The general slope of the country is to the Clyde, or to the vale of the Black Cart. The waters of the North of Ayrshire are discharged chiefly by the Garnock, which flows in a direction opposite to that of the Black Cart,—or into the Frith of Clyde by small streams on the west.

Few places in Scotland are more interesting to the geologist than Ardrossan, as there the old red sandstone and coal formations are distinctly to be seen, if not in contact, separated only by a large whindye, which expands and forms the hill upon which the old castle of Ardrossan is built. To the north of this dyke the old red sandstone, which soon passes into red sandstone conglomerate, has been quarried upon a large scale to build the harbour, and to the south of it, at a very short distance, coal has been dug from strata which crop out upon the dyke. The dyke itself is composed of light blue fine-grained greenstone. The dyke is not to be distinguished in appearance or character from the beds of greenstone which are quarried for road-metal in the coal district at Paisley, Elderslie, &c. Calcareous spar of various colours is found in it, also calcedony and agate. These are in small veins and in inconsiderable quantities. The islets to the south of the pier, being of similar materials with the dyke, are probably the remains of part of it, the rest having been removed by the action of the sea. The coal strata on the sea-beach are greatly deranged as they approach the dyke, being fairly set on edge, or turned round nearly 90°. They consist of slate-clay, limestone containing a few organic remains, and ironstone in various alternations. The coal strata so displaced are included between the large dyke, the expansion of which forms the Castle Hill, and another to the south of it upon which the baths are built. It is not known whether the larger dyke intersects the secondary rocks in the neighbourhood, as they are mostly covered with sand or clay; but for the short distance that it can be traced, it runs parallel to the coal strata set on edge. The red sandstone strata in contact with this dyke *dip* to it. To the south of the smaller dyke, coal has been worked lately (at a very short distance), from strata lying in the usual position, viz. at a very small angle of elevation. This *edge-coal* field runs into the sea on the one hand, and forms the south side of the Castle Hill on the other.

Proceeding along the Frith of Clyde from Ardrossan northward, the coast is composed of red sandstone, and red sandstone conglomerate intersected occasionally by greenstone dykes. The first dyke of considerable size is seen near Kilbride. On the level land near the sea it

is not to be seen, but where the road to Portincross leaves the main road, a house-stead has been cut out of it, and it may be traced running into the hills for a very considerable distance, accompanied by a very remarkable elevation of the surface, as if it had either protected the neighbouring rocks from disintegration, or had itself been the cause of their elevation. The greenstone composing this dyke is darker coloured and larger grained than that of the dykes at Ardrossan. Large boulders of greenstone lie scattered upon the beach, which have most probably had their origin in that part of the dyke no longer elevated above the level land near the shore. Soon after passing the village of Portincross, another dyke of similar materials occurs rising from the beach so boldly as to form a complete wall, which has been cut through to the depth of ten or twelve feet, to form the rude path which here leads along the shore. Farther north—in the parish of Kilbride,—a huge mass of columnar porphyry forms the three eminences called the Three Sisters, part of a precipice from 200 to 300 feet high. These columns rest upon the old red sandstone conglomerate which here rises about half the height of the precipice: the columns rising from it reach the summit. To the right and left of the *Sisters* the conglomerate rises up their sides, so as in part to include or surround them, leaving the porphyry exposed chiefly in front. The general appearance of the whole is extremely grand and imposing. It looks as if a considerable mountain had been cut in two, and one of the halves carried away so entirely that scarcely a fragment should remain. Several greenstone dykes of considerable magnitude intersect the conglomerate here, and their course may be traced by the eye to the summit of the cliff. Upon the south end of the cliff a bed of conglomerate lying in a conformable position, but at a very high angle of elevation, is interposed in the ordinary red sandstone conglomerate. This bed is 130 yards in thickness, and is remarkable for being composed of very large boulders of trap-rocks—occasional boulders of primitive and transition rocks, however, also occurring in it. One of these trap-boulders measures two feet nine inches in diameter. The portions of primitive rocks form a very small part of the whole mass. This bed may also be traced to the summit of the cliff a little south of the Three Sisters, but it does not attain to their elevation.

About this place dykes of greenstone and porphyry are very numerous, and have occasioned much derangement of the conglomerate in passing through it. But an enumeration of all the dykes to be met with here would be a burdensome task. Some of them run east and west,—others in a direction nearly north and south, cutting the con-

glomerate into patches nearly rectangular, or sometimes approaching to the rhomboidal form. Without a plan on a very large scale, nothing more than a general description of them would be intelligible.

Inland from Portincross, and behind the promontory formed by the Three Sisters, is a piece of level land which extends around this headland, which has evidently been at one time covered with water. When this was the case, the hill at Portincross must have formed an island. In cutting some drains in this low land, some of the dykes visible at the other side of the hill were cut through.

At Hunterstown Point many acres are covered with boulders, principally of trap-rocks; but it is said that many of these stones were conveyed artificially to their present position with a view of sheltering Fairlie Roads from the swell occasioned by south or south-west winds.

On the level land between Hunterstown and Fairlie, it is reported that an attempt was made a number of years ago to find coal. As the whole tract is formed of old red sandstone or of trap-dykes, it is needless to say, the attempt failed.

Between Portincross and Fairlie the old red sandstone conglomerate rises from the beach to an elevation of 600 or 700 feet, and a quarry for millstones has been opened in it at Kaimhill, from which a great number have been cut. The conglomerate is here covered by greenstone, in which some good specimens of rock-crystal have been found. The greenstone forms a distinct well-defined bed upon the conglomerate, which may be traced almost round the hill. Nearer Fairlie, although the coast is of old red sandstone, a considerable tract of trap-rock intervenes between it and the highest elevation attained by the sandstone conglomerate, which is seen more inland about the source of the Water of Caaf, and as far down it upon the inland slope of the hills as Knockandon. The origin or continuation of this insulated piece of trap-rock may probably be found at Fairlie, where a very large trap-dyke of irregular thickness has been cut through to form the present road, and is still quarried for keeping it in repair.

The millstones from the quarry of Kaimhill were in great request before granite, greenstone, and other rocks came to be employed for this purpose. They were often conveyed from this place to very considerable distances. The taking them off the hill was a work of much labour and difficulty. No carriage of any kind could reach it from want of roads, and the millstones were transported by the united labour of men and horses. The latter were harnessed to a long piece of wood, called a *wand*, which passed through the centre of the millstone, and by

it the stone was guided, whilst men behind with ropes served to keep back the stone on going down hill,—the millstone rolling along upon its edge like a wheel.

At Hailie Brae, near Largs, may be seen the old red sandstone with the secondary trap-rocks: the latter of which are distinctly seen in the channel of a small rivulet to overlie the former. A small island laid down between Fairlie and Largs in Bleau's Atlas has now disappeared. From Fairlie to Largs the beach is mostly composed of gravel; but sandstone, whiter in colour than the old red sandstone, forms to a considerable height, the slope of the hills of secondary trap behind Hailie. There can be little doubt that this sandstone, notwithstanding its colour, is in reality part of, or associated with, the old red sandstone. Similar pieces of white sandstone, intimately connected with the old red sandstone, may be seen in Arran and other places in the vicinity. Indeed, near Portincross there is a pillar forming a gatepost, one half of which is of old red sandstone, and the other half of sandstone almost white as if bleached by some chemical agent, a well defined line separating the two colours. The quarry on Hailie Brae, from which the new quay at Largs has been built, is in this sandstone. Numerous rounded nodules of white quartz are found in it. The strata in this quarry are on edge, and the workings are carried on almost to the junction of the sandstone with the trap-rocks which form the summit of the hill. At one end of the quarry the workings have laid bare part of a greenstone-dyke. This dyke seems not to have disturbed the strata farther than to cut through them at right angles to their direction. The cause of the derangement of the strata may be looked for, probably, in the great mass of greenstone forming the summit of the hill.

Passing a small stream called Gogo, the trap-rocks descend nearly to Largs, which stands upon gravel that must at one time have formed part of the channel of the Frith. This gravel is composed of almost every variety of rock. A little above Largs, on the Gogo, may be seen one of those small hills of gravel common at the confluence of streams with lakes or still water. The summit of this hill may probably mark out the measure of the last retreat of the water, or the elevation of the land. Between the Gogo and the Noddle, no sandstone is found *in situ*, the trap-rocks being the lowest rocks visible.

Leaving Largs, and passing the Noddle, the old red sandstone again appears, forming cliffs near the coast 30 or 40 feet in height. This sandstone is the rock upon which the soil rests to the sources of the Noddle and the Routan Burn, which, running in an opposite direc-

tion, falls into the Frith of Clyde at Innerkip. This is the widest tract occupied by the old red sandstone, these two streams running upon its junction with the secondary trap-rocks which form the highest parts of Renfrewshire. This may, at least, be stated generally, although the line of junction leaves the Noddle a little under Outerward House, which it passes, and then passes down Red Burn, a branch of Routan Burn. Near the mouth of Red Burn, the junction is very easily noticed. The old red sandstone here dips to the secondary trap.

The Shaws Reservoir covers the line of junction for a considerable distance; but upon the side of Dunrod Hill, at the breastwork of the Reservoir, the old red sandstone is seen to form the base of that hill, of which the summit is formed of trap. On three sides of the hill the old red sandstone may be seen, and the summit of trap overlying it. From this point the old red sandstone declines in elevation, and disappears altogether for a considerable distance, but again becomes visible in the prolonged ridge of Dunrod Hill near Greenock, still, however, overlaid by the trap. Between Greenock and Port-Glasgow, it is quarried in many places, but finally disappears at Port-Glasgow, a little to the east of the *Clune Brae*. The trap which overlies the old red sandstone of Dunrod Hill, is connected with, or indeed forms a part of, the great secondary trap formation of the district.

The rocks upon the shore from Largs to Innerkip, with the exception of dykes, are wholly of old red sandstone. Dykes are numerous, but perhaps not so numerous as between Largs and Ardrossan. Some beds of limestone are contained in the old red sandstone, but they are of no value in an economical point of view. These beds are accompanied by slate-clay: they are almost always on edge; and the appearance of the whole reminds one forcibly of a coal-field in miniature.

At Innerkip, the trap-rocks approach the Frith; but, except in the form of dykes, they do not reach it. The old red sandstone forms part of a ridge of inferior elevation between Dunrod Hill and the Frith. This ridge extends along the coast from Innerkip to Greenock. The side of this ridge nearest the Frith, is for the most part composed of old red sandstone and sandstone conglomerate; but the side nearest Dunrod Hill is of trap. The line of junction is near the summit of the ridge; but a large mass of trap passes through this ridge and reaches the Frith, where the Cloch Lighthouse stands near the middle of its breadth. It may probably be an expansion of this mass which covers the side of the ridge nearest Dunrod Hill; and this latter, again, is connected with the trap which forms the summit of Dunrod Hill and of that ridge. At the east end of Gourock, there is an opening in the ridge, through

which a road passes. The bottom of this small valley is old red sandstone, although the summits of the hills between Gourrock and Greenock are of trap.

Upon the point of land which forms the south side of Innerkip Bay, and upon the slope behind the village, is a bed of limestone, which has been wrought to a considerable extent. This limestone rests upon the old red sandstone in a conformable position, and dips to the north. It contains few organic remains. The bed is 8 or 10 feet thick. It does not, however, descend to the shore, and seems to be of rather limited extent.

At Gourrock a large mass of porphyry forms a hill, which has been quarried to a great extent for causewaying, road-making, and similar purposes. Fluor-spar is found in this porphyry, with small rock-crystals, brown-spar, oxide of manganese, &c. This porphyry forms Kemnock Point: it is columnar, the columns of an irregular number of sides, and 20 or 30 feet high. It is surrounded by old red sandstone, except towards the Frith, whose shore it reaches. Unlike the other porphyries of this district, this is of a light blue colour, varying, however, in intensity. It may easily be mistaken for greenstone, which it much resembles. The fluor-spar found in it almost universally occurs near the surface, lining the inside of drusy cavities. The crystals are small, rarely measuring a quarter of an inch on the side.

A little south of Kemnock Point, two dykes, composed of wacke, partly amygdaloidal, rise from the beach. They soon unite into one, which runs onward in the direction of the nearest porphyry. This dyke is chiefly remarkable for having *spread out*, and covered the old red sandstone with which it is in contact. This may be very distinctly seen on the beach; and the idea is forcibly suggested of the wacke in a fluid state being ejected from below; and spreading out upon the surface of the including rock.

At a little distance inland from Gourrock, the sandstone has been wrought for the carbonate of copper which it contains. The operation was carried on to a considerable extent, but is now abandoned. The sandstone here is a continuation of the old red sandstone of the coast, but containing less iron. Numerous small specimens of slaty anthracite are found in it. The copper-ore is not found in veins, but is disseminated through the rock, seeming to incrust or cement together the little particles of quartz which compose the sandstone, and penetrating these particles themselves so much as to tinge them slightly of a greenish colour. The only copper-ore found at this place is the *green carbonate*. The quantity at present visible is very small, as no mass

of it is any where to be found ; and there is no prospect of its ever being wrought to advantage.

In proceeding along the coast to Greenock, the secondary trap-rocks, as before remarked, again approach the beach. The trap-rocks here are principally amygdaloidal. On the slope of the hills around Greenock, sandstone occurs. This sandstone, like that in the vicinity of Gourock, already noticed, contains less iron than the old red sandstone of the coast, although evidently belonging to the same formation ; nor does it in this neighbourhood assume the character of conglomerate so often as elsewhere. A few years ago a number of bores were made in it in search of coal : it is almost needless to add that no coal was found. Searching for coal in old red sandstone shows how ill geology was understood by the numerous body of people who favoured this enterprise. It is matter of surprise that such an attempt should have been made ; or, after being begun, that it should have been so long persisted in.

A little way from Greenock, on the Gourock road, lime was worked some time ago ; but the working has now been abandoned. The lime was here found in the form of calcareous tufa. A similar bed was also formerly wrought at Gourock.

The old red sandstone continues to form the coast to Port-Glasgow, where the secondary trap-rocks reach the level land on the shore of the Frith, a little to the eastward of Clune Brac.

The dykes which traverse the old red sandstone have already been repeatedly noticed, and a few of the most important have been described. To describe them all, setting out of view the inutility of the task, would be next to impossible. From Ardrossan to Port-Glasgow, they occur in very great numbers ; but in general their appearance is pretty much alike ; the principal differences being in the size and extent of the dyke, or in the degree of fineness or coarseness of grain in the matter composing it. Some, as at Gourock, are of wacke or of amygdaloid ; but, with very few exceptions, the dykes are of greenstone or of porphyritic greenstone. In some places they cross each other ; and, without indulging in theory, the conclusion seems very obvious, that the dyke which crosses another must be the newest of the two. In like manner, it may be inferred that the whole of the dykes included in the old red sandstone must be of newer formation than the sandstone which incloses them. At the foot of the hill which rises abruptly from Port-Glasgow, one of these dykes has been extensively quarried, and an inspection of it is very interesting. It is of greenstone, coarser grained than the dykes at Ardrossan. Near the surface it has spread

out, and inserted part of its substance between the beds of old red sandstone in the form of a wedge. In addition to the instances of the occurrence of calcareous tufa which have already been specified, many others might be given. A large mass of it was discovered in forming the harbour of Ardrossan, and was burned into lime for building the harbour. But it may be remarked that this substance is found chiefly in irregular patches *near the junction* of the old red sandstone and trap formations ; and in this manner it occurs occasionally from Ardrossan to Greenock. Numerous nodules of it are scattered in the channel of Noddle Burn, showing that it is plentiful in the sandstone on the northern side of that stream. Near the outlet of Shaws Water Reservoir, the road has in part been formed of limestone, some of which has been burned at this place ; and its appearance would indicate that the quantity here is considerable. As lime is very much required in this district, it appears strange that farther trial should not be made for it. Nodules of tufa abound in some of the small streams in this neighbourhood ; and, with a moderate degree of care, the places from whence they are derived might be discovered. Besides the irregular patches of tufa, other beds of limestone are met with in this quarter. One or two such beds have been wrought upon the coast, and one near the junction line at Outerwards in the parish of Largs.

The last traces of old red sandstone upon the Renfrewshire side of the Frith, disappear a little to the east of Port-Glasgow. This extensive formation may be traced from the south of Kintyre through Arran and Bute, the greater isle of Cumbrae, part of Ayrshire, and part of Renfrewshire. It forms part, likewise, of the peninsula of Roseneath ; also part of the basin of Loch Lomond at its south-east end, and may be traced across the Forth to the German Ocean, forming a belt between the primitive and transition rocks of the Highlands and the secondary rocks of the Lowlands. Forming, as it does, in some degree, the basin of the Frith of Clyde, it is almost impossible for the most heedless observer to travel along that part of the coast which is composed of it, without being forcibly struck by the marks which it affords of the former higher level of the sea. Whether, indeed, the water has receded, or the land has been elevated, may admit of dispute ; but no one can doubt that the waters of the Clyde, or of the sea on this coast, once extended to cliffs that are 30 or 40 feet above the present level of the sea. Numerous rounded boulders of primitive and transition rocks lie at the foot of these cliffs ; and the level land which intervenes between them and the Frith is full of shells exactly similar to those which are still plentiful on the adjacent shores. Numerous holes, in which the *pholas*

may have lodged, are still to be seen far above the level of that animal's present habitations. Nor is this appearance confined to Renfrewshire and Ayrshire. The islands of Arran, Bute, and Cumbræ, give evidence of the elevation of the land, or depression of the level of the water, in a way not to be misinterpreted. In the greater Cumbræ, a greenstone dyke, of highly crystalline structure, has withstood the effects of the atmosphere and of the sea; whilst the red sandstone on both sides of the dyke, being more easily decomposed, has been wasted away; and the dyke now stands elevated thirty feet or more above the present surface of the sandstone. Instances of this kind are very frequent. There is a very fine one in Ayrshire, in a dyke already noticed, near Kilbride. The appearance of this dyke may be supposed to indicate that it had carried up the red sandstone with it, which stands as a sort of bulwark upon each side of it. The part of this elevated sandstone which is nearest the sea may have been carried away by its action, whilst the more inland part, not having been so long subject to that action, still remains. In like manner, at many other places, the old red sandstone, being very easily disintegrated, has left the whin-dykes standing, whilst its own substance has been wasted away. If the dyke is thick it may continue without support for a long time; but when thin, it appears to have been generally laid prostrate, of course strewing the beach with stones, which would gradually be converted into those boulders and pebbles of trap-rocks now so very plentiful on the shore. *

Nor are these apparent proofs of a change in the level of the water found only on the coast. The level inland parts of the country, both in Renfrewshire and Ayrshire, present many phenomena which lead to a similar conclusion. The dykes at Rashlee, in the parish of Inchinnan (to be hereafter noticed), afford very convincing evidences of its reality. In digging the Ardrossan Canal, innumerable sea-shells were found between Paisley and Glasgow, exactly similar to those now found in the

* This dyke is generally believed to pass from Cumbræ to the mainland, where a dyke of the same kind makes its appearance near Hunterstown Point. There is a curious legend connected with it. The wizard, Michael Scott, assigned, as a task to the fiends in his employment, the erection of a bridge from Cumbræ to the opposite shore. The work was nearly completed when some passenger wished the architects "God speed," and the arch immediately fell into the sea, leaving only the *landstools* or abutments. After this, says the legend, Michael found his troublesome servants constant employment by appointing them to twist ropes of sand *at Irvine bar*! The dyke in Cumbræ bears the name of the *Devil's Dyke* to this day.

Frith of Clyde. The sand in which they were found resembled the freestone sand of the Clyde, and was regularly stratified, as if deposited from still water. Instances of this kind are so numerous as scarcely to attract notice, although it seems to follow from them, as a consequence, that the sea formerly flowed over what is now the low level land of Renfrewshire and Ayrshire, through the valley where the Black Cart and the Garnock have their channels ; thus making the ridge of secondary rocks in the west of these counties, of which Mistylaw may be considered the nucleus, an island. Numerous sandhills, far above the present level of the sea, and also very distant from the present course of running streams indicate the change which the surface of the country has undergone. Among many instances which might be adduced, the sand-quarries or pits at Greenock, at Sandholes near Kilbarchan, at Bridge of Weir, at Kaimhill near Lochwinnoch, and at Head of Side in the parish of Neilston, may be mentioned as illustrating this point. The sand or gravel found at these places is composed almost entirely of comminuted trap-rocks ; freestone-sand being found generally at a level less elevated above that of the sea. From the sparing quantity of comminuted freestone to be found in these sand or gravel pits, it may be inferred that the freestone rocks of the coal-measures were not subjected to disintegration (perhaps were not formed) at the time that this sand or gravel was deposited. The secondary trap rocks would seem, at the time of the formation of these deposits, to have been violently acted upon by running water ; but this may have taken place prior to their attaining their present elevations ; or the attrition by water might be effected whilst they were under the level of the sea. The elevation of the secondary trap may have been progressive and comparatively slow : this allowance being made, the deposits in question may be more easily accounted for. *No streams at present in existence can in any way account for their formation.* No shells, it ought to be remarked, are found in these very interesting deposits where they are chiefly derived from trap-rocks ; but upon minute inspection, small pieces of primitive and transition rocks, and even of old red sandstone, may sometimes be detected ; the presence of which may probably be owing to the same cause which placed fragments of these rocks upon the summit of the secondary trap. The more recent deposits, formed from the disintegration of the coal-measures, contain unaltered shells in abundance. Foreign countries need not be visited for proofs of the prodigious changes which the surface of our globe has undergone. They are every where numerous ; and in few places more so than in the district now under consideration.

Leaving the coast, and proceeding nearer the centre of the ridge

which extends from Ardrossan to Greenock, the old red sandstone, as has already been stated, disappears, and the secondary trap-rocks, which overlie it, become visible. These consist of greenstone, often highly crystalline, amygdaloid, wacke, porphyry, trap-tuff, claystone, &c. The wacke, when much coloured by iron, is called *osmont* in this part of Scotland, and is used for the construction of ovens, limekilns, &c. Its fragments are sometimes exceedingly like bricks; and it possesses the useful property of resisting (when in mass) the action of fire better than most kinds of stone. It is also a very slow conductor of heat; and these qualities recommend it for the purposes in which it is chiefly employed. But it would be impossible to enumerate the various appearances which these trap-rocks assume. Altering their character in a very few yards, or perhaps feet, specimens of very different appearance may, in innumerable instances, be found almost in contact with one another. The greenstone is often *globular*, as at Gavelmoss, in the parish of Lochwinnoch, where this structure is to be seen in a very distinct manner. The nucleus of each globule is very hard and indestructible. The amygdaloid and wacke are frequently vesicular. The wacke is often seen presenting an appearance which might almost be described as scoriaceous, impressing almost the most indifferent spectator with the idea that it has undergone the action of fire. The greenstone often assumes a rudely columnar form; but the columns are at no place defined with much precision. They decompose most readily at the joints and angles; and it appears not improbable that this may have given rise to the globular form already noticed. The porphyry is also sometimes columnar, as in the insulated mass at Portincross (already noticed), and in the dyke at Gourrock; but this appearance is not so frequent in the porphyry as in the greenstone.

These trap-rocks form the highest lands of the parishes of Ardrossan, West Kilbride, Dalry, Largs, Kilbirnie, Lochwinnoch, Innerkip, Greenock, Kilmalcolm, Houstoun, and Kilbarchan. They occupy an area of many square miles. Although producing numerous simple minerals, prized by the mineralogist, no metallic ores, properly so called, have yet been found in them; with the exception of carbonate of copper, numerous specimens of which are found upon the lands of Kaime, in the parish of Lochwinnoch. Iron and manganese are, indeed, also found in these rocks, but in very small quantities. The copper-ore at Kaime is found in a fine-grained greenstone dyke, which passes through amygdaloid and wacke. It occupies vesicles or cells in the greenstone of the dyke; and the wacke and amygdaloid immediately in contact with the dyke are also impregnated with it. A consider-

able vein of sulphate of barytes is contained in this greenstone-dyke ; but in this vein not a single trace of copper has been detected. No attempt has been made at this place to search for copper by mining, although traces of it may be seen on the surface for more than half a mile. In one or two places, the stone is so much impregnated with copper, that no vegetation appears on its surface. Many of the vesicles of the greenstone-dyke contain small crystals of quartz ; and fine specimens of fibrous green carbonate of copper are to be found, but never of any considerable size. The copper here is, indeed, as at Gourock, all in the form of green carbonate ; but at Gourock none of it assumes a fibrous appearance.

The porphyry occupies, for the most part, the centre of the ridge of hills of secondary trap, whilst the other rocks above enumerated compose the outskirts of the mass. This is the case particularly on the southern side of the ridge. The highest hills are composed of porphyry, as Mistylaw, Hill of Stake, and Queenside.

Queenside Hill is cut by an immense vein of sulphate of barytes, in which a mine was wrought upwards of sixty years ago, in search of lead, but without success. Another attempt, made about eighteen years ago, was equally unsuccessful, not a trace of lead being found. The sulphate of barytes is now quarried, and sent to Glasgow, to be ground down as the basis of a paint ; and a mill has been erected near the quarry for facilitating this last operation. It is understood, also, that this mineral is used by paper-makers, calico-printers, and manufacturers of porcelain. Some parts of the vein are brownish or flesh-coloured, others are of a snowy whiteness. Some of the barytes is crystallized ; but, in general, it is massive. The vein varies from three to fifteen feet or upwards in thickness. The barytes is distinctly laminated, the laminæ being parallel to the sides of the vein. It contains many minute crystals of quartz, and a little calcareous spar. The vein sends off various small branches ; but the general direction is from N. E. to S. W. At its north-eastern end, it divides into three veins ; two of which run nearly at right angles to the principal vein. It was in the branch-veins that the searches for lead took place. The principal vein may be traced for nearly half a mile, forming the channel of a considerable rivulet, from which it rises in cliffs to the height of eight or ten feet.

Numerous dykes of greenstone intersect the outskirts of the porphyritic mass, which forms the highest lands of Renfrewshire and of the north of Ayrshire. Towards the centre of it they become comparatively rare. One well-defined dyke, of a peculiar kind of porphyry,

passes through the common porphyry, of which Queenside Hill is composed; and also through the trap conglomerate in the channel of the Calder, at a wooden bridge near Muirshields. This porphyry has in colour much the appearance of greenstone, being *green*, whilst that which surrounds it is *brown*. It contains many crystals of glassy felspar. There is little doubt of the propriety of calling this rock *greenstone-porphry*, as the basis seems to be greenstone. The course of this dyke may be traced a considerable way, rising above the surface of the moor; it being less easily decomposed than the other porphyry through which it passes. It has been used for building, and makes a very good building stone.

The dyke just described forms a fall in the Calder. Greenstone-dykes, in passing through the porphyry of this elevated and hilly district, give rise to many water falls. The porphyry decomposes more readily than the greenstone; and the streams, crossing the course of the dykes, carry away the porphyry on their lower side, whilst the greenstone much longer resists the action of the water, and protects the porphyry above. In some places the streams run parallel to the dykes. A beautiful instance of this may be seen at *Reeking Linn*, a very wild and romantic fall in the Calder. The Calder here runs for several hundred yards parallel to a dyke of very fine-grained greenstone; then, suddenly bending, crosses it, and forms the *linn* or *spout*. The dyke is thus admirably exposed to observation. It is composed of prismatic pieces of greenstone, as nicely joined together as if the work of art. The channel of the Calder at this place, however, is not composed of porphyry, but of amygdaloid, which has been cut by the water to a depth of from twenty to thirty feet. The banks of the stream are high, and overhung by wood.

The *Spout of Garnock* is a wild and romantic waterfall upon that stream in the moors of Kilbirnie parish. The rock here is also porphyry. The porphyry upon the east side of the fall is much rent, and has fallen forward in the direction of the fall, or rather into the deep gully in front of it. The rents penetrate the rock to an unknown depth. As this effect could not be produced by the action of the fall, it perhaps may, with justice, be ascribed to some slight shock of an earthquake. The huge masses of naked porphyry which lie in confusion under the fall, give it an air of wildness, unequalled by any thing in this district.

On the *Murchan*, a rivulet which joins the Garnock a little way below the *spout*, is another fall, as high as that of the Garnock, or higher. The Murchan Burn here falls over a dyke of columnar greenstone, the columns lying at right angles to the course of the dyke.

The Water of Raith runs on porphyry through its whole course. In a small rill which joins it, there is a vein of calcareous spar nearly two feet thick, which forms a kind of calcareous conglomerate, containing numerous pieces of porphyry inclosed in it. Except sulphate of barytes, the porphyry of this district contains few minerals; sometimes coarse jasper is found in it. Where the Water of Raith joins the Calder, a great mass of trap-conglomerate forms the channel of the Calder, and the conglomerate is intersected by numerous dykes of fine-grained greenstone. Trap-conglomerate is also found in the channel of the Calder, at the mouth of *Roughburn*, and at various other places.

Whilst the porphyry of this ridge is barren in minerals, the zone of greenstone, amygdaloid, wacke, &c. which surrounds it, contains them in great plenty, especially those of the zeolitic family. Red foliated stilbite is found abundantly in a coarse-grained greenstone rock which forms the channel of Calder, a little above the farm-house of Clovin-stane, in the parish of Lochwinnoch. It occurs in patches of no determinate figure, some of them more than a foot in diameter, accompanied by calcareous spar, and often mixed with it. The greenstone in which it is found overlies a large mass of amygdaloid; which, having been worn away by the action of the current, the greenstone, left without support, has fallen down in large masses. Beautiful specimens of red foliated stilbite, needle-stone, chabasite, analcime, and other minerals of the same family, are common in the parishes of Paisley, Nielston, Erskine, Lochwinnoch, and Kilmalcolm. The parish of Kilmalcolm has, indeed, long been celebrated among mineralogists for the beautiful specimens of the zeolitic minerals which it produces, especially of these comparatively rare minerals, chabasite and yellow stilbite. The zeolitic minerals are usually found near the surface; for which reason they are in many instances corroded or decayed. Wacke is the rock in which they most frequently occur; and next to it, coarse-grained greenstone. In the parishes of Nielston and Paisley, however, they are found in a bluish amygdaloidal porphyry. They are never found in *druses*, properly so called, but in rude holes in the rock, which holes are wholly or in part filled with a moist tenacious clay, from which it is almost impossible to free the minerals. Probably these holes have been filled by infiltration from above. It sometimes happens that the zeolitic minerals are found imbedded; and sometimes, but not very frequently, siliceous minerals are found in holes, as above described; and with the same kind of clay, as at Linthills, and at Lairdside Hill, in the parish of Lochwinnoch. Some fine specimens of

of agate, rock-crystal, carnelian, and amethyst, are found in the parish of Lochwinnoch, and at Catburn in the parish of Largs ; but they are neither very large nor very abundant.

A very interesting variety of rock was discovered a little to the west of the village of Kilbarchan, a short time ago. It consisted of pieces of calcedony, from the smallest size to an inch or more in diameter, held together by an argillaceous cement. The calcedony is of a light-bluish colour. The pieces are angular, as if rudely broken and afterwards mixed with the cementing paste. The rock composed of this singular mixture is extremely hard. It overlies very fine-grained greenstone, and is itself overlain by claystone. The upper part of it is in the form of thick and not very well-defined flags, lying flat, not unlike some of the coarser greywacke-slate in general appearance ; the under part is more solid. Its whole depth has not been exposed by the cutting ; but about 4 feet in thickness is visible, and about 20 feet in length. It is found nearly at the junction of the secondary trap-rocks with the coal strata, but is itself contained in the former.

From Ardrossan eastward, the *coal-formation* occupies the more level parts of the county of Ayr. It rests upon the slopes of the secondary rocks, or ascends towards their summits, but with very unequal elevations. Its course will be best understood from the accompanying map, in the colouring of which its position is pointed out. It may be remarked generally, that it rises to a greater elevation in Ayrshire than in Renfrewshire. In the former, in the parishes of Kilbirnie and Dalry, it attains an elevation of from 400 to 500 feet above the level of the sea ; but in Renfrewshire, it scarcely reaches half that elevation. High Craig, near Johnstown, composed of the *newest floetz-trap*,* and overlying the coal-formation, may be nearly 250 feet in height, and is the highest point in the coal-district of Renfrewshire.

In following the line of junction along the map, it may be remarked that, in many places, the junction of the coal-formation with the secondary trap has been correctly ascertained even to a few feet or yards ; whilst in others this exactness cannot be attained, the rocks being covered with *alluvium* or *diluvium*, more frequently with the latter. In the parish of Erskine, it appears most probable that the coal-formation

* This term is used not as involving a theory, but to distinguish the trap which overlies coal from the secondary trap upon which the coal-formation of this district rests. Yet it is hardly possible to believe that trap-rocks overlying or stratified in coal-fields, are of the same age with the great mass of unstratified greenstone or porphyry upon which the stratified rocks rest.

occupies the whole of the level part of the parish from Bishoptown to the south-east. Still this is in some degree a matter of probability rather than of certainty; and, owing to the cause above-mentioned, cannot be determined very satisfactorily, as only a partial experiment has yet been made to ascertain the existence or non-existence of coal.

At Rashilee, in the parish of Inchinnan, about a mile farther up the Clyde than Erskine Ferry, two greenstone-dykes have been most extensively quarried, both for embanking the river and for road-metal. Their direction is nearly east and west. They rise at least 20 feet above the surface of the surrounding country; which, with considerable inequalities of surface, slopes pretty gradually to the Clyde. The dykes are 100 feet or upwards in thickness. The one farthest to the south is that at present quarried. It is composed of very fine-grained and dark-coloured greenstone, partly columnar, but the columns not well defined. The whole dyke has more the appearance of huge laminæ set on edge, so perpendicular, that two or three of them have been left to support the sides of the quarry from falling into it, an accident which has sometimes happened, disclosing stratified freestone, fire-clay, and slate-clay upon both sides of the dyke, rocks evidently belonging to the coal-formation. This dyke has been quarried from the high-water level of the Clyde to a distance of almost one-fourth of a mile inland. Small pieces of crystallized quartz, with calcareous spar, are found in it. Partial workings have taken place in the westernmost part of it, which still remains about 20 feet above the level of the neighbouring ground. But it is only in that part of it which is quarried to a depth of 50 or 60 feet under the surface of the ground, for the purpose of embanking the Clyde, that the junction of this dyke with the strata forming the coal-formation is visible. These strata seem little or not at all disturbed, and lie in a position nearly horizontal. The northernmost dyke has been longer quarried than the other. It is described as having once risen much higher above the surface than the southern dyke; but that part of it, with the exception of a few yards, is entirely quarried out; and nothing of the dyke here remains visible, except the bottom of the quarry. The stratified rocks form a sort of wall on each side of both these dykes. A thin layer of very coarse argillaceous limestone may be seen on the south side of the northern dyke, interposed between the dyke and the ends of the horizontal freestone strata. The ill-defined columnar, or rather laminated, structure of the southern dyke, has been already stated, as well as the perpendicular position in which the laminæ are found. In the northern dyke, which is coarser grained, the laminæ or columns are

inclined at an angle of about 70° . The columnar form is here more distinctly seen than in the southern dyke; and in both, the structure is more apparent, near the surface, than at a considerable depth. In the northern dyke, the breadth slightly increases upwards; the sides of the southern dyke are perpendicular, or very nearly so. The diluvial hill upon which South Barr House stands, prevents these highly interesting dykes from being traced through its breadth; but to the west of that hill, and almost in the line of their bearing westward, a dyke similar to them crosses the new Greenock and Paisley road, which was cut through it to the depth of about 20 feet. The country on both sides is nearly level. The force which upheaved the dykes at Rashlee must have been very different in its mode of operation from that which upheaved the dyke formerly described at Ardsrusan. In the latter case, it appears as if the greenstone had carried the stratified materials along with it, altering their position from horizontal to vertical; in the former case, the greenstone seems to have filled fissures in the strata, without occasioning any derangement, and to have risen above them without overflowing and spreading upon their surface. The columnar form, observable in them all, must have been the result of consolidation, after their materials had been injected into their present localities. It is said that both of the dykes seen at Rashlee cross the Clyde, and that they may be traced to a considerable distance eastward in Dumbartonshire. The writer has had no opportunity of doing so, but there is no improbability in the report.

In the parish of Houston, the coal-formation has been laid bare by the Gryfe; and a little coal has been dug at Goldilee, where limestone overlies it. The coal at this place is somewhat interesting, as it forms part of a larger basin or trough, which, at a place called Cateiraigs in the parish of Kilbarchan, divides into two distinct parts, the smaller of which crosses the Gryfe into the parish of Houston, whilst the main body extends westward nearly to Bridge of Weir, almost in a triangular form. The dip is to the east. The side of the triangle nearest Gryfe has been explored by numerous workings (in the parish of Kilbarchan) as well as the apex near Bridge of Weir; whilst the base is almost equally well defined, running parallel to the road from Bridge of Weir to Johnstown, and has been wrought formerly at Lochermill, and now near Sandholes. The coal of this basin is covered by limestone, which has been long wrought, and a pit is at present sinking to the dip, which will dry an extensive field both of coal and limestone. The *slate-clay* or *mill* in this coal-field contains many bivalve shells. A dyke composed of *slate-clay* runs through the Kilbarchan portion of this field from east

to west, and throws down the strata nearly nine fathoms. The branch of this coal-field towards the *rise* may be considered as elevated above the surface of the surrounding country; as, with very little stretch of imagination, the spectator can trace both the north and south side of it in a mass visibly elevated above the slope of the surrounding trap upon which it rests. The slope is so steep as to be cultivated with difficulty. Where this coal-field divides, an angular portion of the secondary trap interposes itself in the bifurcation. The eastern side of the field is still unexplored, and it may probably be continued to, or even under the level land of the county near Linwood. A pit is at present sinking about half a mile further to the dip than any hitherto sunk, which will perhaps discover something of this matter. The whole line of junction in the west of Kilbarchan parish between the secondary trap and the coal-strata is particularly definite: the east of the parish, although belonging to the coal-formation, remains nearly unexplored. The following tables exhibit the strata found in sinking pits in the coal-field already mentioned, at Goldilee in the parish of Houston, and at Kaimhill in the parish of Kilbarchan.

AT GOLDILEE.

	Feet.	Inches.
Clay,	12	0
Flag,	20	0
Limestone,	7	0
Till,	1	0
Coal,	2	6
Fire-clay,	5	0
Limestone,	4	0
Fire-clay,	2	0
Black till,	19	0
Coal,	0	10
Grey till,	13	0
Greenstone,	5	0
Grey till,	5	0
Freestone,	5	0
Coal till,	0	9
Coal,	1	3
Fire-clay,	5	0
Whinstone (which descends to the west),		

AT KAIMHILL.

Surface soil,	5	0
Clay,	21	0
Black till and ironstone,	15	0
Flag,	14	0
Limestone,	7	0
Till,	2	0
Coal,	2	6
Fire-clay,	7	0

	Feet.	Inches.
Limestone,	6	0
Grey till, with two bands of ironstone, about 4 inches each,	22	0
Coal till,	1	0
Coal,	0	10
Fire-clay,	1	0
Sandy till,	2	0

In Lochwinnoch parish the line of junction is well defined, with the exception of a small part concealed by the waters of Loch Winnoch. In Kilbirnie and Dalry, nearly the same precision is attained. Caerwinning Hill, in the latter parish, is composed of secondary porphyry, upon which, on the south-west side, limestone strata, abounding in entrochi and encrini, rest at a very high and conformable angle of elevation. Limestone is extensively quarried at Houret in this neighbourhood. This limestone is neither attended with coal, ironstone, nor freestone. It rests upon a thin bed of slate-clay, which appears to be superimposed immediately upon the secondary trap-rocks. The dip is to the east. A great part of the lime used upon the coast, from Fairlie to Gourrock, is supplied from this place. At Baidland Hill, farther to the westward, a vein of *splint-coal* is enclosed in claystone, which last belongs to the secondary trap-formation, and is joined to the other trap-rocks, without any apparent interposition of coal-strata of any kind. The sides of this vein are smooth and well defined. It was discovered in ploughing the field in which it occurs; and a black streak, appearing in a neighbouring field while in cultivation, most probably points out its further course. Although no freestone is found in the neighbourhood, small pieces of it have been thrown out in partially working the coal of this very curious vein. These fragments exhibit vegetable impressions; and some fragments of the coal itself, from the outside of the vein, bear a striking resemblance to the bark of trees. These pieces are very inflammable, burning with a white flame and much smoke. These are only from the outside of the vein; the body of the vein is *splint-coal*. The coal has been wrought to the depth of six or seven feet from the surface; but the depth of the vein is uncertain, as the working is partly filled with rubbish. But the man who dug the coal asserts that he went down till the sides of the vein absolutely met. No line of demarcation can be pointed out between the claystone in which it occurs and the secondary greenstone, porphyry, and other trap-rocks of the neighbouring hills to the north and west. Perhaps the vein may be of the same age as those masses or beds of trap which, in some cases, interstratify, and in others overlie, the coal-formation; but on a subject so obscure, it is perhaps better not to offer a decided opinion.

The nearest limestone may be about half a mile to the south-west. At the west end where the working has ceased, the coal assumes a position approaching to the horizontal, but dips rapidly to the north. In short, the vein seems as if it had been *twisted* from its position, and made to descend into the trap; or if it be supposed to *arise* from the trap, it appears, in that case, to have been twisted into a perpendicular position. This coal is well deserving the attention of geologists. Farther information about it would be most desirable; but the above is the substance of all that, in present circumstances, can be obtained. It may be added, that it is from 400 to 500 feet above the level of the sea.

At a place about half a mile from Beith, a coarse-grained dyke cuts the coal-strata and reaches the surface, where it was rather extensively quarried. At the place where the quarrying stopped, the dyke divided into two. Abundance of quartz crystals were found attached to a ferruginous crust on the outside of the dyke.

Although that part of Scotland where coal is found, is often called, from that circumstance, the coal-field of Scotland, yet the name is, in one sense, ill applied; for it is apt to convey an erroneous impression of its being one continuous coal-field; whereas, in reality, it is composed of numerous coal-fields, lying within a certain tract or zone. The truth of this assumption is not only proved by the different arrangements of the strata, but also by the absence, in some places, of certain members of the strata commonly found in others. Thus at Hurlet limestone is found as one of the coal-strata. Also at Howwood and Bridge of Weir, it occurs in this manner. But at Hallhill, Quarrelton, Lochwinnoch, Garpel, Narvelston, Kerse, and many other places, coal is found, without limestone as one of the attendant strata. This fact alone is sufficient to prove that the coal-fields are distinct, and constitute separate basins, having little connection with one another, although belonging to the same geological epoch, while a general appearance of similarity is presented in all. The different strata alternate in no definite order, while no one of the strata seems essentially necessary to the formation of a coal-basin. Even coal itself may be wanting, whilst all the other strata, usually found in a coal-field, are there. The place usually occupied by freestone or slate-clay, is occasionally filled by greenstone. Limestone is as capricious in its presence or absence as any other mineral; nor is it possible even to define its limits in the district under consideration. It makes its appearance here and there, more particularly upon the edges of the coal-fields; but its continuity from one place where it is seen to another is by no means certain.

In various places it has been *wrought out*, perhaps indicating that the quarries had been opened in masses, detached by some convulsion from greater strata. But whatever hypothesis may be adopted regarding this matter, none favourable to the opinion of limestone-strata holding a necessary place in the coal-measures of Renfrewshire and Ayrshire, can be entertained. If the strata of limestone ever were continuous, they certainly are not so now; and to support the opinion of their former continuity, a much more intimate acquaintance with their numerous animal remains would be necessary than it is supposed that any one has yet acquired.

The canal from Glasgow to Johnstown is mostly cut through diluvium, but partly through stratified rocks. These are, in some cases, quite horizontal; in others, twisted and disturbed; but no limestone makes its appearance. The difficulty of making the canal was greatly increased by the necessity of carrying it at one place through *running* freestone-sand. This sand appears to be derived from the coal-measures, and contains innumerable sea-shells.

The coal-fields of Ayrshire are almost united to those of Renfrewshire; but, in reality, are separated at Kenmuir in the parish of Kilbarohan, where the secondary trap-rocks are not covered by the coal-formation. Here rocks, from the trap on each side of the vale of Black Cart, meet in the channel of that stream near Elliestown. About half a mile from this point, the out-crop of the coal-strata is visible on the banks of Loch Winnoch. These strata dip towards Ayrshire, and extend into it, or rather they may be considered as an extension of the Ayrshire coal-field. Near Nielston, the coal-strata, from the Ayrshire coal-fields, crop out a little to the east of Loch Libo; and the secondary trap-rocks of Hartfield, abounding in prehnite, make their appearance. About half a mile farther east from this place strata, connected with the coal-formation of Renfrewshire, are distinctly visible on the banks of the Leveran, and coal has been wrought to a small extent. It has been stated that the coal-strata not only form a series of coal-fields, but that these strata are different in their arrangement at different places. At Quarreltown, near Johnstown, indurated clay forms one of the mineral-beds which cover the coal; while at Hallhill, within a very short distance, indurated clay is wanting, and greenstone forms one of the beds overlying the coal. At Black-dyke, very near the place last mentioned, neither indurated clay nor greenstone overlie the coal; but their places are supplied with limestone and slate-clay. There is some probability that the coal of Quarreltown and Hallhill are altogether distinct from that at Black-dyke; yet there is

at least as much probability that the coal at the two former places may extend so far to the north-west as to lie under the Black-dyke coal. The coal of the two former places has not been so far wrought to the north or north-west as either to confirm or refute this probability. Should it hereafter be found that the Quarreltown and Hallhill coal are overlain by the Black-dyke coal, the former will be found at a much greater depth from the surface than where at present wrought. The deposition of the coal-strata must have been a period of comparative tranquillity and repose. The subsequent eruption of the trap overlying the stratified rocks, appears, from the derangement which it has occasioned, to have been accompanied with violent commotion.

The greenstone at Hallhill is distinctly stratified. In digging the coal-pit there, the following was the order of beds found, reckoning from the surface:—

	Feet.	Inches.
Freestone and slate-clay,	18	3
Greenstone,	86	10
Freestone, with shale,	50	4
Coal,	3	10
Slate-clay,	10	2
Coal,	10	0

The following is a journal of a bore made to ascertain the amount of coal in the lands of Maxwelltown near Paisley. Limestone and iron-stone are, in this instance, both wanting.

	Feet.	Inches.
Earth and sand,	10	0
Brown freestone,	11	6
Indurated clay,	2	8
Black slate-clay, with coal,	2	0
Indurated clay,	5	2
Hard freestone,	8	6
Indurated clay,	6	6
Slate-clay,	1	6
Coal,	1	0
Indurated clay,	1	9
Dark freestone,	19	5
Slate-clay,	0	4
Coal,	0	8
Light blue slate-clay,	6	0
Freestone,	18	6
Light blue slate-clay,	0	8
Hard slate-clay,	0	8
Light blue slate-clay,	3	8
Hard slate-clay,	0	11
Soft freestone,	6	4
Hard freestone,	6	6
Brownish slate-clay,	8	6
Light blue slate-clay,	10	10

	Feet.	Inches.
Coal,	1	2
Indurated clay,	1	1
Coal,	3	6
Light blue slate-clay,	8	0
Freestone,	17	9
Hard blue slate-clay,	1	9
Freestone,	7	6
Light blue slate-clay,	2	10
Dark slate-clay, with coal,	2	6
Indurated clay,	0	6
Coal,	2	0
Indurated clay,	0	2
Coal,	3	4
Indurated clay,	2	10
Light blue slate-clay,	0	10
Indurated clay,	6	6
Slate-clay,	1	0

At Quarreltown the strata are very different, as appears from a section published in the 14th volume of the Edinburgh Encyclopædia, p. 318.

Greenstone covers the coal at Barr Hill, near Kilbarchan; and a few hundred yards to the north-east, coal is found under limestone, but unaccompanied by greenstone. The coal at Barr Hill has been wrought by mining into the hill, without any pits being sunk. This kind of coal-mine is provincially called a *Creepy Heugh*.

In the district extending from Kilbarchan towards Houstoun, and towards Johnstown, an immense quantity of ironstone is found in the coal-formation; while, at other places in the coal-district, ironstone is scarcely or not at all met with. It appears singular that no attempts worth mentioning have been made to work iron-ore, either in the north of Ayrshire or in Renfrewshire where it is abundant. A great quantity of ironstone is found in the parish of Lochwinnoch, particularly at Aird Meadow on the banks of the loch, and at Narvelston. It is also abundant on the banks of the White Cart and the Leveran, and in many other places. It is stated that, on the estate of Blackhall near Paisley, there are no fewer than twenty-eight strata of ironstone, contained within ten fathoms of the surface, their aggregate thickness amounting to $7\frac{1}{2}$ feet. Limestone is found in the immediate neighbourhood. Small quantities of ironstone are conveyed from Hurler and other places to Glasgow, to be smelted; but there is yet no blast-furnace in Renfrewshire or the north of Ayrshire.

There are no hot-springs in the district now described, although calcareous tufa is found; but, so far as the writer knows, it is only found in the old red sandstone, and always near the secondary trap.

Limestone is only found in considerable quantity in Renfrewshire and the north of Ayrshire as one of the strata of the coal-formation, and most frequently overlies the coal. This is the case at Hurlet in the parish of Paisley, at Sandholes in the parish of Kilbarchan, at Goldilee in the parish of Houstoun, at Howwood in the parish of Lochwinnoch, at Swinridgemuir and Braidstane in the parish of Beith, and at numerous places in the parish of Dalry. But although, where limestone is found, coal is almost always found under it, there are many places in which *coal* is found without limestone overlying it; and in this case the coal is better in quality than in the other.

Limestone is burned at Howwood in the parish of Lochwinnoch, where it is dug by mining; as also at some other places in that vicinity. The following table exhibits the order and thickness of the strata at Howwood:—

	Feet.	Inches.
Surface clay,	36	0
Black shale (very soft),	1	6
Ironstone,	0	3
Black shale,	2	7
Ironstone, in two bands,	0	8
Black shale,	3	9
Ironstone,	0	4
Black shale,	5	3
Ironstone,	0	3
Black shale,	10	0
Ironstone,	0	7
Black shale,	2	3
Ironstone,	0	6
Black shale (very strong),	1	0
Black shale, containing much iron,	4	0
Black shale,	32	0
Grey slate-clay, containing shells,	20	0
Limestone,	10	0
Black shale,	4	0
Coal,	3	3

But the great supply of lime in the western parts of this district is from quarries in the parishes of Beith and Kilbirnie in Ayrshire. In the more central parts, the supply is from Hurlet and Blackleadmill in the parish of Paisley, from Goldilee in the parish of Houstoun, and from Sandholes in the parish of Kilbarchan. Nearly all the limestone of Renfrewshire is found considerably under the surface, so that the mining of it is both troublesome and expensive; whereas, in the north of Ayrshire, limestone is found with very little *cover* over it. All this limestone abounds in petrified shells, coral, &c., and the slate-clay above or under the limestone likewise contains them in profusion. A rich

harvest of fossils yet remains to be reaped in this hitherto unexplored field.

No lime in this district is so extensively wrought as that of Braidstane near Beith. The following table shews the order and thickness of the strata at this place, from the surface downward, so far as yet explored:—

	Feet.	Inches.
1. Surface soil,	1	0
2. Limestone, full of encrini and bivalve shells,	14	0
3. Fire-clay,	4	0
4. Limestone,	1	0
5. Indurated clay,	1	0
6. Coal,	1	0
7. Slate-clay,	6	0
8. Limestone, with few organic remains,	18	0
9. Coal,	1	3
10. Slate-clay, depth unknown.		

The sale of lime at this place amounts to some thousand chalders annually. The outcrop of the strata to the north extends from east to west, upwards of a mile. At the east end they occupy a space of limited breadth; farther to the west the breadth is not explored. A fine-grained greenstone-dyke traverses the strata from north to south. The limestone, containing many organic remains (No. 2 of the strata), does not continue so far to the eastward as this dyke; the other strata, down to the next limestone, are cut off by it, and do not reappear on the east side of it; whilst the lower limestone (No. 8 of the strata), thrown up nearly to the level which they occupied, is found immediately under the soil. The upper limestone (No. 2 of the strata) was wrought for several years as marble, and was formed into chimney-pieces, tables, &c. This work is now discontinued, not from any want of material, which is inexhaustible, but from an opinion that the appearance of the marble is dull and not very ornamental. It is almost entirely a mass of organic remains. No ironstone is found in connection with this limestone; but at Swinridgemuir, and other places in that neighbourhood, ironstone is found in connection with a limestone which is possibly a continuation of this, although more probably not. This field of limestone presents to the north, for more than half a mile, an abruptly sloping front, as if it had been elevated above the surface on which it was originally deposited. The external appearance is very similar to that of the field of coal and limestone at Goldilee and Kaimhill already noticed. Ten well defined strata *take on* (as miners graphically express it) at different distances to the south. This interesting field is believed to extend as far in different directions as Swinridgemuir

and Barkip. The dip and direction of the strata are the same throughout its whole extent; and the *dyles* or *troubles* traverse it in *nearly* the same direction. At Coal Burn, a narrow trough-shaped coal-field is at present wrought; the breadth of which does not exceed from 180 to 240 yards. It lies in the freestone of the larger basin of Swinridgemuir; and while the freestone of this larger basin dips to the south, the strata of the smaller basin dip nearly to the west, or at right angles to the dip of the strata of the larger, and in its line of direction. The dip of the strata throughout this neighbourhood is generally to the south or to the south-east; but this small basin and some others form exceptions to the rule.

Limestone is more frequently seen on the outskirts of the coal-measures than in the central parts of them, exceptions—at least apparent exceptions—occur at Hurlet and Blacklea-mill; but the outcrop of the strata is not so well exposed in the level coal-districts of Renfrewshire as in the higher ones of the north of Ayrshire. Concerning the causes of such phenomena, it is perhaps better to hazard no conjecture.

Sometime in 1814 a mineral spring was discovered on the farm of Candron, about two miles north-west from Paisley. The place had been remarked as frequently resorted to by pigeons. Saline depositions were observed on the furrows, and the water near these depositions was found to be salt. A well was soon dug; and, in digging it, the workmen passed through plastic clay, with shells, to the depth of ten feet, when they came to sandstone, from the fissures of which the water sprung on the east side. Mr Lyall of Paisley analyzed a wine-gallon of the water by evaporating it, and obtained a residue of 220 grains, which was found to contain—

Carbonate of Lime,	.	.	.	.	8 grains.
Sulphate of Lime,	.	.	.	.	5 ...
Sulphate of Magnesia,	.	.	.	.	30 ...
Muriate of Magnesia,	.	.	.	.	27 ...
Muriate of Lime,	.	.	.	.	40 ...
Muriate of Soda,	.	.	.	.	110 ... [†]

This spring was much resorted to, for some time, by persons from Paisley; but it is now almost forgotten.

On the banks of the Locher, not far from Kilbarchan, an incrusting spring was discovered about ten years ago; and similar springs are to be found in the parish of Kilbirnie. A number of calcareous incrustations were found lately, in digging an aqueduct at Millbank, in the

* See an Essay on Candron Well, &c. by Robert Lyall, surgeon, Paisley (1814).

parish of Lochwinnoch. A greenstone-dyke has thrown the strata down at least five feet. The calcareous incrustations occurred among debris from the sides of the burn, but only at or about this dyke, where a very small spring is seen to percolate from the top of the bank; to which, in all probability, the calcareous matter has owed its origin.

Near Hallhill, in the parish of Lochwinnoch, a dyke of sandstone cuts the greenstone of the coal-formation; but as the coal is not wrought at the place, it is not known if the dyke descends to the coal, or if it cuts the greenstone only.

None of the coal-fields of Renfrewshire or the north of Ayrshire are free from *dykes*, *faults*, or *troubles*. Few of the dykes reach the surface; and, consequently, it is impossible to trace them farther than where coal has been wrought; and the workings are always of very limited extent. One exception to this occurs in the parish of Eastwood, where a derangement of the strata may be traced for two miles in the line of dip, which is from north-west to south-east; while another derangement, in the opposite direction, may be traced for half a mile. In no two coal-fields are the *troubles* exactly similar in character. They run in every direction; and, while in some instances they merely cross the strata without displacing them, in other instances they throw the strata up or down, as may be seen in the parish of Eastwood, sometimes, not less than 100 feet. Where *dykes* reach the surface in the coal-measures and may be fairly traced above the surface, as at Rashilee in the parish of Inchinnan, at Whorlhill in the parish of Lochwinnoch and various other places, the displacement of the strata, if any, has not been ascertained, no workings for coal having been made in their immediate neighbourhood. The dykes at Rashilee and Whorlhill are of greenstone. A dyke at Kaimhill, in the parish of Kilbarchan, which displaces the strata 54 feet, is composed of indurated clay (almost slate-clay), abounding in bivalve shells, and containing fragments of ironstone.

None of the coal-fields of this district extend over a wide surface. Quarreltown coal, which, in one place, is almost 90 feet thick, occupies a basin-shaped cavity, of no great extent. The coal-fields of Lochwinnoch (also called Castlesemple Loch) is of very limited extent, and is in the form of an elongated basin or trough. The outcrop of one of its sides is at the old castle of Peel, the other near Lochside. It is cut by a greenstone-dyke, traversing it nearly from north to south. The coal-fields at Lochhead and Narvelston, in the same parish, are also very small. The coal at the latter place runs into Ayrshire, and has been mostly wrought out. Several small fields also occur in the parishes of

Dalry, Kilbirnie, and Beith. One place, near the old Castle of Kilbirnie, contains a bed of splint-coal ; and under this, at a depth of six fathoms, a very good slaty coal is at present wrought. Both coals are overlain by limestone. A coal has been wrought for a number of years at Hillend, in the parish of Dalry, which is considered particularly good for welding iron. This is also a very small field ; and as it dips to the secondary greenstone in the immediate neighbourhood, the working of it cannot long continue.

The coal at Hurlet has been wrought for nearly 300 years. Its dip is to the east ; and the bed of coal is 5 feet 3 inches thick. In Mr Wilson's Agricultural Survey of Renfrewshire, sections are given of the coal-fields of Glasgow and Hurlet, which are so unlike each other, that there is no probability of their being continuous. But as the country from Hurlet to Glasgow is alluvial or diluvial, and the strata not exposed, it is impossible at present to mark out the limits of the separate coal-fields or basins. All which can with certainty be said, is, that the low land of Renfrewshire, to the east and south-east, forms part of the coal-formation ; and, consequently, that a trial for coal might be made in any part of it, with a rational prospect of success. It seems surprising that such trials should have been so seldom made. Probably the wants of some future generation may lead to the discovery of coal, wher its existence is now unsuspected or overlooked.

From Ardrossan the coal-formation extends to the south ; and the parishes of Ardrossan, Stevenston, Kilwinning, Dalry, Kilbirnie, and Beith, are wholly, or in part, composed of it. Near Beith, the limestone of this formation overlies brown porphyry, which forms Cuff Hill and Brownmuir Hill ; and the porphyry is succeeded by greenstone and amygdaloid, at Threepwood, farther to the east. These rocks extend over a considerable portion of the parishes of Beith and Lochwinnoch, forming the south side of the hollow in the parish of Lochwinnoch, where the coal-formation appears. In the parishes of Paisley, Nielston, and Lochwinnoch, this greenstone tract is again succeeded by a porphyry, containing much prehnite and other zeolitic minerals. The base of this rock is wacke, of very dark colour ; and it may be called blue amygdaloidal porphyry, for it is amygdaloidal as well as porphyritic. It forms a table-land, which terminates at Stanely-braes on the east. Its termination, both to the east, north, and south, is steep ; but, upon the western side, it slopes gradually towards the Frith of Clyde, and disappears under the coal-formation. This porphyry is little disturbed by dykes, and covers six or eight square miles. Like the porphyry of

the hills to the west of the vale of Black Cart and Garnock, it is of secondary formation. Traces of copper have been found in its prehnite; but it is barren in minerals, except those of the zeolitic family. For these however, Hartfield in Paisley parish has long been known as a locality. Unfortunately, they are too often found near the surface, and often covered with clay or oxide of iron, which spoils their lustre. At one point, already referred to, this porphyry crosses the vale of the Leveran, and is connected with the secondary rocks to the south of it; and these are continued through the parishes of Nielston and Mearns, until they join the range of hills, forming the *water-shed*, which divides the sources of the White Cart and the Irvine.

It thus appears that the coal-strata of Renfrewshire and the north of Ayrshire are contained chiefly in two valleys, or in their expansions. The one valley contains the streams of Black Cart and Garnock flowing in opposite directions; the other contains the streams of Leveran and Lugton, flowing likewise in opposite directions. It is not, however, to be supposed that these streams have *formed* these valleys. So far from this being the case, the Lugton is the only one of them which may be said to have its source in the valley. The other streams have attained a considerable size before they reach them; and, on reaching them, bend suddenly and follow their course. *Valleys of denudation* are nowhere found in this district. The modifications which the present streams have effected in their course, appear to have been comparatively inconsiderable. Each of these valleys expands into the low land of Renfrewshire on the east, and into the low land of Ayrshire on the west. The greater valley, that of the Black Cart and Garnock, is also the lowest; the greatest elevation of the bottom of the valley near Kilbirnie Loch being probably less than 100 feet. The greatest elevation of the bottom of the other valley, near Loch Libo, according to a late survey, is 423 feet above the level of the sea; but the coal-strata do not reach this elevation by upwards of 150 feet. The extent of the coal-formation in these valleys, or along their sides, is well defined; but in the low lands in which they terminate, the same precision cannot be attained, owing to the cause already stated.

A minute description of the coal-fields of this district would be very interesting, but would, of itself, furnish abundant materials for a long essay. However, in the present state of information regarding them, this description could not be given with accuracy. In only a few places could correct sections of the strata be obtained without very considerable difficulty. In others they could not be obtained at all.

The extent of the dykes, which traverse the coal-fields, cannot be known until the relations of these fields are better understood than at present. Although a dyke is known to exist in one field, it is next to impossible to establish its identity with a dyke in another field, even where their courses may happen to coincide. But the directions of dykes are very various. Instances of this have been already given. Another may be added. At Hallhill, in the parish of Lochwinnoch, a greenstone-dyke crosses the strata in a direction nearly from north to south, while a dyke of sandstone, already noticed, traverses the upper greenstone nearly from east to west.

The sandstone of the coal-measures of this district is interesting, not only in a geological but also in an economical point of view; nearly all buildings of importance, both public and private, being constructed of it. Sometimes, as at Swinridgemuir, it does not altogether overlie the coal, but more frequently it does. Several acres of coal at Swinridgemuir are found cropping out almost to the surface from diluvium, without any stratified material covering the coal.

The sandstone is found in strata varying in thickness from seven or more feet to even less than an inch. The surface of the strata is generally waved or striated. Much of this stone is susceptible of a very fine polish; and it may be had in blocks of very large dimensions. Upwards of 300 men are employed in quarries of sandstone in this district; and these quarries are almost entirely confined to the sandstone of the coal-measures; a few only, and these of little interest, being carried on in the old red sandstone of the coast, which is by no means either so useful or so beautiful, being of an unpleasant colour, and liable to injury from the weather. A sandstone quarry has long been wrought at Nitshill, in the parish of Paisley. The sandstone is here found in a series of beds, amounting altogether to upwards of 80 feet in thickness. Three quarries, on a very considerable scale, are wrought in the parish of Eastwood, which employ 150 men. All these quarries produce a very fine stone, which may be had either in large blocks or in very thin flags. The same may be said of the quarries at Millbank and Barr, in the parish of Lochwinnoch, and of that at Kilbirnie. The sandstone at Barr overlies a thin bed of bituminous shale. The sandstone of all these quarries, to a greater or less degree, contains carbonized wood. Although the sandstone is to be had in masses at these quarries and elsewhere, or in plates of large dimensions, it not unfrequently occurs in a shattered form, and, in that case, is nearly useless for building. Instances of this are so frequent, that it seems superfluous to mention them; but the cause appears to be, that thin layers of oxide of iron

penetrate the substance of the stone in every direction ; and it breaks by these layers with great facility. In other cases, it often happens that, although the blocks composing the strata are individually large, they are separated by intervals of considerable size, filled with diluvium, and the form of these blocks is indeterminate. It would appear that the former kind of *cracks* or *flaws* arise from the composition of the rock itself. In the latter case, the rents appear to have been formed after the rock was deposited. The quantity of sandstone contained in this district is immense : it far exceeds the limestone in extent. The general dip of the sandstone, as well as of the other stratified materials composing the coal-district, is to the south or south-east ; but exceptions are very numerous.

There is one fact regarding the valley of the Black Cart and Garnock, which must not be passed over in silence. The two lochs which occupy part of it, Loch Winnoch, or Castlesemple Loch, and Kilbirnie Loch, formed only one at no distant period. They are at present separated from each other by a tract of alluvium, which in very high floods is still mostly covered with water. The change in this important feature of the appearance of the district, was effected by an extensive system of drainage. Of the two lochs which remain, one formed the upper and the other the lower end of the ancient lake. The upper loch (Kilbirnie Loch), is much deeper than the lower. Upwards of 250 acres of admirable land have been reclaimed from this ancient lake, and brought into a high state of productiveness.

At a period more remote, the ground upon which the village of Lochwinnoch stands has formed a large bay in the original lake, which has been filled up by depositions from the Calder, a large stream which falls into Loch Winnoch, near the village. The level land here, is composed of gravel, exactly similar to that at present deposited by the Calder at its mouth ; and this gravel is formed of comminuted trap-rocks, sparingly mixed with small pieces of primitive rocks, transition rocks, and old red sandstone, of which detached portions are scattered over all the trap-rocks of this district.

In Bleau's Atlas the old form of the lake may be seen. Loch Winnoch and Kilbirnie Lochs are there laid down as expansions of the lake, which, between them, is considerably narrowed ; and this perfectly agrees with what the present appearances of the country and the known reduction of the level of the water would lead us to expect.

Westward from Kilbirnie Loch, a tract of very level land extends to the village of Dalry, a distance of about three miles. This has also been at one time evidently covered with water. The Garnock runs

through it, flowing westward, but, in high floods, it has been known to send off part of its waters eastward through Kilbirnie Loch and Lochwinnoch. Two or three feet added to the height of the channel of Garnock, opposite to Kilbirnie Manse, would cause part of the stream still to flow in that direction. There is much probability, that a barrier once obstructed the Garnock, near the village of Dalry, and if ever this was the case, the Garnock must have flowed, partly at least, eastward, and joined the Black Cart. But the anastomosis, in present circumstances, is only occasional, and of very rare occurrence.

In concluding this view of the geology of Renfrewshire, and of the north of Ayrshire, it may be proper to remark generally,—

1. That the coast of the Frith of Clyde from Ardrossan to Port Glasgow is composed of old red sandstone passing frequently into old red sandstone-conglomerate, which must be considered as a rock of the same epoch. That from Cloch Lighthouse to Port-Glasgow the sandstone is less intersected by dykes than in any other equal distance, and less frequently assumes the form of conglomerate, including pebbles of smaller size, when it does assume this form, than at Portincross or Kelly: that the old red sandstone and conglomerate dip generally to the north, but vary to north-east, and occasionally even to south or south-east: that the sources of the Caaf water in Dalry parish, Shaw's Water Reservoir, and Waterside in Innerkip parish, are the most inland points at which the old red sandstone is to be seen, and that its highest elevation is nowhere much above 600 feet.

2. That at irregular distances inland, the secondary trap-rocks overlie and succeed the old red sandstone, and may be seen in the most evident manner to overlie it at various places, as at Dunrod Hill, in the parish of Innerkip, where the old red sandstone may be seen to pass fairly under the trap; and at Kaimhill in the parish of Kilbride, where the same thing may be observed of the old red sandstone-conglomerate.

3. That still farther inland the coal-formation overlies the

secondary trap-rocks ; but that in each of the two principal valleys in which the coal strata are found the secondary trap-rocks intersect them and interrupt their continuity, whilst the secondary trap-rocks are thus rendered continuous and may be traced from the eastern parts of Renfrewshire, without interruption into Lanarkshire, through Mearns and Eaglesham.

Soils.—In this district the *alluvial* soil is the best, particularly when resting upon an absorbent subsoil. But as this soil is composed of almost every rock, with an admixture of vegetable matter, its superiority cannot be fairly attributed to any particular rock ; yet the preponderance of trap-rocks in the district would lead to a conjecture in their favour.

The soil known to be produced from the decomposition of trap-rocks is decidedly next in point of fertility. It, however, happens unfortunately that great part of it is found in situations, and under circumstances, which counterbalance its natural good qualities. Much of it occupies the summit or steep slopes of hills, as Mistylaw, Queenside, Hill of Stake, Corlick, and others too high for profitable cultivation. The elevation of this ground also attracts clouds and rains ; and under such circumstances, a strong tendency is produced to the growth of mosses. Hundreds of acres in such situations are covered with heath. In many instances, also, these rocks decompose slowly, and the soil, however excellent in quality, is far too shallow for agricultural operations. The parishes of Kilmalcolm and Kilallan,* exhibit many proofs of the truth of the latter observation, whilst the whole range of hills from Greenock to Ardrossan exemplifies the former. It is only where the situation is not too elevated, nor the soil too small in quantity, that the superiority of *trap soils* can be fairly estimated. But in many of the bogs which now occupy the higher parts of this district, remains of trees

* United to Houston, and not distinguished by a separate name on the map, but forming the *western* part of that parish.

are very common; nor is there any reason to conclude that they did not grow where they are now found. Roots and stumps of large trees, evidently yet remaining where they grew, are of frequent occurrence in the extensive moor which occupies the higher ground. The kinds of wood most commonly found in these situations are birch, willow, and hazel. Could the ground only be dried, similar trees might again grow.

On the outskirts of the hilly district the best *trap soils* are found; but even there the soil is not of uniform quality. The undecomposable nature of some of the trap-rocks, the impervious nature of the subsoil, and the multitude of springs which arise from the trap, in too many instances exercise an influence which all the skill of the farmer has not been fully able to counteract. Little of the soil arising from the decomposition of porphyry has yet been brought into cultivation, but this is altogether owing to the greater elevation at which it occurs. Where a trial has been made this soil seems no way inferior to those from greenstone or amygdaloid, which have been brought into successful cultivation. At Hartfield, in the parish of Paisley, the soil from porphyry has been cultivated with much success; also near Muirshields, in the parish of Lochwinnoch. Near the summits of the highest hills formed of it, in sheltered nooks where the redundant moisture is immediately drained off by some natural filter, spots of great luxuriance, in point of vegetation, are occasionally found, shewing the natural fertility of the soil.

The soil next in order of fertility is *diluvium*, this term being used to signify 'the old alluvial cover,' as distinguished from *alluvium*, which is of more recent origin. Great part of the clay soils of the district seem derived from the first of these sources, which soils, by repeated ploughing, application of manure, exposure to the atmosphere, &c. have acquired their present fertility. The origin of this kind of soil, as to the rocks from which it is derived, is as doubtful as that of

alluvium. It contains numerous pieces of primitive and transition rocks, mixed with limestone, sandstone, ironstone, &c. This clayey diluvial soil forms the greater part of the low lands of this district; but, it is by no means asserted that *all* the clay of the district is *diluvium*, although this is most frequently the case. Clay, at considerable elevations, rests directly upon trap-rocks, from which it probably derives its origin, but diluvium, from whatever source derived, produces excellent crops of wheat, beans, oats, and clover. *Trap soils* excel it in *green crops*, and afford decidedly the best pasture. To this generalization there must be exceptions, but it holds in the greater number of instances. A shallow soil, resting upon, and almost composed of, *trap-gravel*, has been known to bring upwards of L.5 per acre of rent for a period of about eleven months, and that for *grass* only.

The worst soil in the district is that derived from old red sandstone and old red sandstone-conglomerate. The most superficial observer can scarcely avoid noticing its inferiority, especially when in pasture; there are, however, exceptions, as in cases where disintegrated calc-tufa forms part of the soil;—this occurs near West Kilbride. At Knock Hill, near Largs, the summit is formed of trap, and is uniformly covered with verdure; the lower part of the hill, which is of red sandstone, as uniformly has a browner hue. In some instances where peat-moss has begun to accumulate upon red sandstone, and its growth has been arrested by cultivation, a very good soil has been the result. A large tract of land near Skelmorlie might be very easily improved, as the peat has not yet so far accumulated upon the sand as to make its presence hurtful, but rather the reverse. Calcareous tufa is plentiful in the neighbourhood, and at least two subordinate beds of limestone are known. A large tract of land extending from Skelmorlie to Innerkip and Shaw's Reservoir is also capable of very easy improvement. The few farmers who rent this waste district are forced to cart lime a distance

which occupies a whole day, while plenty of it might be had almost at their doors; but the absence of coal may perhaps be the reason why the limestone is unwrought.

The low-lying part of Renfrewshire contains nearly 1300 acres of unreclaimed moss. The soil under it is the best in the district, being *carse clay*. Small encroachments are made upon it from year to year, either by cutting it for peats or by floating it away. Its extent was at one time considerably greater than at present. The mosses in the south-east of Renfrewshire are not so valuable, because lying at a greater elevation. The same remark applies to those in the west of Renfrewshire and the north of Ayrshire. It is, however, a matter of regret to see so much fine soil covered with a substance, in its present state, so very worthless. The farther growth of moss, at least upon the slopes of hills, might be arrested by cutting open ditches and carrying off the supply of water, so necessary for its vegetation, by the application of lime, or by paring and burning; the latter mode should only be resorted to where the moss is very deep. It would be most desirable to see this substance supply, in a great degree the place of coal, the stock of which is not perhaps inexhaustible, whereas the quantity of peat in Scotland, even if it did not grow, is almost unlimited. Whether, by the peat-compressing machine or otherwise, this can be accomplished, remains to be seen, but it is certainly much to be wished for. It would render available mineral treasures of other kinds, as lime and iron, from which fuel is in present circumstances too distant.

[NOTE.—The maps of this district (Ainslie's), published by Thomson, are tolerably correct, especially that of Renfrewshire. Some changes in the position of houses and other minutiae have occurred since the survey was taken, but the course of streams, the position of hills, and other important matters are in general correctly laid down, although hills and rising grounds are not so distinctly marked as might have been wished. One important error deserves notice;—Hill of Stake is neither laid down nor named, although it is the highest hill in the district, lying

on the borders of Renfrewshire and Ayrshire, in the parishes of Lochwinnoch, Largs, and Kilbirnie. It was one of the points of observation in the general trigonometrical survey of the kingdom.

On the map of Ayrshire, by Thomson, Hill of Stake has been laid down, but laid down wrong. On the same map an erroneous position has been assigned to a cascade, 'The Spout of Garnock,' which on the map is called a *Cataract*. But in one important point the map of the north of Ayrshire is defective,—the parish boundaries are not laid down.

In both maps the spelling of names is very incorrect. This would be of little consequence if the sound were similar, but the spelling on the maps frequently makes a very considerable and unavoidable alteration in the pronunciation. The names should either have been given as usually written or as usually pronounced.]

ON THE RURAL MANAGEMENT OF THE FORFARSHIRE PART
OF THE WESTERN DISTRICT OF STRATHMORE. *By Mr*
ROBERT PILLANS NEWTON, Hallyburton.

[Ten Sovereigns.]

THE Vale of Strathmore is proverbial for its beauty and magnificence of scenery. It runs between the two great chains of the Southern Grampians and the Sidlaw Hills; Strathmore, strictly so called, being understood in general to compose the flat of country extending from about Montrose to Perth, although some are not disposed to yield to it so great a compass.

The soil of this district abounds much in blackish loam on a substratum of rock, producing turnip and potato crops of the finest quality, and not easily to be surpassed in the production of barley and oats, especially the former. It is a soil much of which may be said in technical language to be *sharp*, repaying well for liberal manuring with judicious management.

Although the mode followed in cropping the land, necessarily varies with circumstances,—opinion of the farmer, &c.,

yet the five-shift rotation is¹ that most commonly adopted, viz, oats, green crop, barley or wheat, grass two years. We have sometimes thought, that in the rotation of crops there is in some soils often, a great propensity among farmers to over-ploughing the land.

If on many farms where a *five*-shift rotation is adopted, a *six*-shift were followed instead: that is, three years under crop and three years in grass,—or, in professional language, *three out* and *three in*,—land could be made more profitable, and in the end, frequently to produce as great a proportion of straw and grain as with the five-shift management.

In the first place, the items of expense on an arable farm are more numerous than may generally be taken into account. Servants' wages, the keep of horses, tear and wear of carts, ploughs, harrows, harness, &c., the cutting up of roads and fields in driving home the produce of them, and otherwise; and, though last not least, the decreased powers of growth and vegetation which continued ploughing must effect, are all to be considered in the cultivation of arable land. In a district like this, so well adapted, from various causes, for the feeding and rearing of stock, and particularly in a district where the management of live stock is, generally speaking, so well understood, cattle and sheep husbandry might, with advantage, be carried in many cases to a greater extent than even it is at present.

By following the six-shift course of half in crop and half in grass, farmers, while in all probability they would clear more profit by the additional live stock which it would enable them to maintain, would, as before hinted, be at last no losers even in the quantity of grain produced as compared with what the farm yielded under a five-shift course of management; because the superior crops which the land ought to yield under the six-shift rotation, should prove as abundant as those produced under the more extensive cropping involved in the five-shift management. Much less manual, as well as horse,

labour would be required, and the farm thus carried on at considerably reduced expenditure.

Wheat has not been very extensively raised in this district of Strathmore of late years, though, formerly, attempts were made to grow it on a much more enlarged scale than is now practised. The inroads of the wheat fly are very much blamed for the unproductiveness of this crop, but the real truth is, that our land is scarcely strong enough for wheat, though of course, to this we find exceptions.

The breadth of wheat sown in the district this season (1837) has been vastly less than for many years past; but the cause of this did not proceed so much from any apprehensions of failure by the ravages of grub already noticed, as from total impossibility of getting the land prepared and sown in time, on account of the extreme inclemency of the weather at the proper season. But indeed the comparative value of wheat and barley in the market has of late been so very different from what we have been used to consider their relative price, that we should imagine that those who may have been disappointed as to any part of their wheat crop this year need not consider it as a subject of great regret.

Barley may be said to be the crop most congenial to the soil of this district, and Strathmore barley is rapidly becoming almost proverbial in the country. Until of late years, English barley was in general sown, which, for malting and weight, is undeniably far superior to the Scotch barley. Within the last few years, however, Scotch barley has been a good deal sown, and the weights produced from it are sometimes very considerable. The Scotch is found to ripen considerably earlier than the English barley, and a greater return of straw is produced. On good barley land, there are instances where the Scotch kind has been sold to *brewers*, to whom it has given great satisfaction. Chevalier barley is also now becoming a favourite variety in this district, although only introduced within the last few years from England. The

ears very much resemble those of the common English barley, but contain, on an average, two or four more grains in each ; the grain being rounder and more plump. It has the disadvantage, however, of being eight or ten days later in ripening than the common barley, and is therefore not so well adapted for inferior and late soils.

Oats are also extensively and very successfully cultivated in this district. The potato oat is the sort most generally sown, but in many farms common oats are cultivated to some extent. On poor soils the common oats are perhaps most to be recommended, and indeed there are many soils in this district on which the potato variety would scarcely grow. The Hopetoun oat has also been very much sown for two or three years past. No doubt the straw is both longer and stronger than that of the potato-oat, and the grain is found to ripen a few days earlier ; but when we consider that this oat is much more liable to smut than the other, and not so well coloured, it is not much to be wondered at if the more common varieties shall still be more generally liked.

Before quitting the subject of grain crops, a mode of paying the reapers of the corn crops in this district, more commonly practised here than in any other, deserves our notice. We allude to that of paying shearers by the threave. A threave of oats and barley is reckoned two stooks of twelve sheaves each, or twenty-four sheaves, and a threave of wheat is reckoned two stooks of fourteen sheaves each, or twenty-eight sheaves. For the barley and oats, the common allowance is 3d per threave, and for wheat 4d. Each sheaf of oats and barley must be 32 inches, and that of wheat 36 inches in circumference at or about the corn-band of the sheaf, and the grieve or overseer generally carries a gauge with him, by which, when necessary, he is enabled to check the girth of each sheaf.

This method of paying the reapers is attended with con-

siderable advantages, if a steady and attentive overseer is constantly in attendance upon them. It is evident that a better day's work will be obtained than on the day's-wages system, because the more the reapers cut down, the more they will earn. Again, in a district like this, where harvest labourers are not numerous in proportion to the quantity required, and where consequently a farmer has not the advantage of the choice of hands which *ports* (hiring markets) of shearers afford to farmers in the Lothians, it is much fairer to both parties that the reaper should be paid according to the extent of work performed. This system, too, affords a chance to man, woman, and child, to earn a little in harvest, and it is the griever's business to see that the reaping is properly executed. No victuals are furnished by the employer, as in the Lothians, so that, taking everything into account, a saving of expense is effected by the threshing method of cutting the crop. The stubble will be found in general, to be closer cut, because the more closely grain crops are cut to the ground, the sooner will the sheaf be made up, and therefore, of course, the more the reaper will earn. It may be interesting to observe, that the difference of prices between shearing by day's wages, and according to the threshing mode, is not great, although, for the reasons already stated, the latter is here almost universally preferred. It is calculated, that on a fair average of harvest-wages, the crop should be cut at about 8s. per imperial acre by day's wages. Now, a tolerable shearer ought to cut down about eight threshes of oats and barley per day, which, at 3d per thresh, is 2s. ; and as thirty-two threshes may be said in round numbers to be a fair average quantity of these kinds of grain per imperial acre, this would just bring it exactly to 8s. per imperial acre. Again, six threshes of wheat is reckoned a fair average shear per day, which, at 4d. per thresh, is just 2s., and as twenty-five threshes of wheat are reckoned a fair average crop per acre, this would bring the

expenses of shearing the wheat to about 8s. 4d. per imperial acre. Of course, bandsters' wages are not included in the above calculations.

With regard to the green crops most cultivated in this district, potatoes and turnips may be said to take almost exclusive precedence. Both, in a feeding county like this, are most important crops, and there is perhaps no agricultural district where the husbandry of both is better understood. In the potato crop, the variety called the Perthshire-red is still decidedly the favourite for field culture, although many of the other varieties are to be met with, sometimes over a considerable extent. To dwell upon these, in speaking of a plant of which there are now 146 known and established varieties, would be alike tedious and uninteresting.

Of the varieties of turnips sown, the Yellows and Swedes (*Rutabaga*) are considered the best. Dale's Hybrid was very much in vogue two or three years ago, but its fame seems by no means to be on the increase.

In the turnip husbandry, it is a practice very commonly adopted here to eat one-half of the field with sheep on the ground,—and the effects of such management never fail to shew themselves most materially on the succeeding crops. The turnips, when intended to be consumed on the ground, are manured when sown, with generally from 12 to 16 bushels of bone-dust per imperial acre. For the introduction of this very valuable manure the district is indebted to Mr Watson at Keillor, and for which a very handsome public acknowledgment was made to him soon after.

The bone-dust and *sheeping* together form a most ample and rich preparation for the barley crop, which generally follows the turnips. The land ought to be *ribbed* immediately upon the removal of the sheep from the ground, which is the most effectual method of amalgamating the dung and urine, while yet in a fresh state, with the soil. The land is ploughed for the seed-furrow afterwards.

The practice of eating turnips on the ground in this way cannot be sufficiently urged upon farmers, particularly upon lightish dry land. The ground receives a rich and wholesome manure, and the compressure of the soil by the sheep's treading is an additional advantage not to be lost sight of. Bone-dust manure, too, previously sown with the turnips, is more lasting in its effects than many suppose. In support of this we have the testimony of Sir Humphrey Davy, who says, that the earthy matter in bones prevents the too rapid decomposition of the animal matter.

Considering it quite unnecessary to dwell longer on the varieties of crops cultivated, there being little that is new which can be said in regard to them, we shall now give some account of the live-stock management of the district,—a department of rural business at once the most interesting, and, properly conducted, often not the least profitable.

There is no branch of their profession to which Strathmore farmers in general pay so much attention as to that of live-stock management. The fact is, that there are inducements and facilities from the local circumstances of the district, which render it matter of no surprise that the management of live-stock should be so well understood. The distance from large towns renders the disposal of green food, other wise than by feeding at home, quite out of the question. The increased facilities for *the disposal* of stock, too, may be mentioned as an additional and not unimportant inducement in this department. Besides numerous markets, most of them of considerable extent, the steamers from Dundee to London carry both cattle and sheep in great numbers; and so easy has the intercourse with the London markets for the sale of stock become, that what is shipped on Wednesday from Dundee is sold in the London market on the Monday following, and a remittance of the proceeds is obtained on the Thursday. In the Glasgow market also, cattle and sheep from the district meet a ready sale.

Pure breeds of cattle of any kind are only to be met with

in the hands of two or three individuals in the district ; but as the Angus polled cattle are the peculiar breed of this county, it may be proper to give some account of them.

The Angus polled, or, as they are called by the country people, *doddied* cattle, are well known to Scotch dealers and to the country generally. They have long been the breed peculiar to the county of Forfar, though some remains of the original horned Angus breed are still occasionally to be met with. The prevailing colour of the horned Angus cattle was black, and they had a considerable resemblance to the present Aberdeenshire breed. They are, however, shorter in the leg, thicker in the shoulder, rounder in the carcass, and fully straighter in the back than the Aberdeenshires, and they are acknowledged to carry their head better. They are supposed to have originated in a cross between the Highland and Low country or *doddied* breed. But to return to the *doddies*.

The origin of the Angus *doddies* is very remote, and, indeed, can scarcely now be traced. They were rendered attractive to agriculturists at first from their extreme docility and quietness, a quality more or less peculiar to polled cattle in general, and they were found advantageous also on account of the few accidents sustained from injury to each other, either in the straw-yard or the stall, as compared with the horned kind. The Angus *doddies* bear a very marked resemblance to the Galloway cattle, and are often mistaken for them. An experienced judge, however, discovers that the Galloways are smaller, shorter in the legs, and thicker in the shoulder than the Angus *doddies*. The treatment in the bringing up of the two kinds is very different. The Galloways have to endure the hardship of a moist climate, and are generally winter fed in the open field, whereas the Angus cattle are always wintered in the straw-yard, besides having the advantage of a comparatively mild and genial climate. This difference of treatment renders the Galloways more

hardy looking than the Angus kind, and the latter is found to handle more kindly than the former.

The pure Angus polled cattle are generally black, and it is considered by the very few in the district who possess pure stock of this kind to any extent, so important to preserve the colour of their stock, that they do not allow an animal of any description, whose colour is other than black, to be near their cows when stunted by the bull. Perhaps the largest and most successful breeder of this stock is Mr Watson at Keillor, who gave an interesting account of his mode of management, in a letter to the Highland and Agricultural Society of Scotland, which is also important, because the system detailed in it is in many respects applicable to the successful breeding of Short-horns also. Mr Watson states that "The cows intended for nursing, generally calve early in the season, about the month of January or February, when a strange calf is procured from some of the small tenants in the district who have dairies. This calf is suckled with the others by the same cow, and although the cow at first shews great dislike to the stranger, in a few days she receives it very quietly, care being taken that both are put to suck (one on each side) exactly at the same time, by tying the calves' bands to the stall, or the band of the cow, so as to keep each calf at its own side. They remain with the cow for fifteen or twenty minutes, by which time her milk is perfectly drawn away. As the calves advance in age, they eat hay, sliced potatoes, porridge, and other food they are inclined to take. By the 1st of May, or as soon as grass is ready, they are weaned and turned out from the byre, when two fresh calves are immediately put into their stalls, and receive the same treatment, excepting that they are turned out at 12 o'clock, after they have got their suck, to eat grass, and are brought into the byre again in the evening, when the cows come in to be suckled. This set is ready to be weaned by the 1st of August, and a single calf is put into the feeding-pen, and fattened for the butcher, the season being now too late for rearing. As these are fed off, the cows are let off milk, having each suckled *five calves*. It is necessary to have a very steady and careful person to attend to the suckling, which has to be done three times a-day, viz. early in the morning before the cows are turned out to grass, at mid-day, and in the evening when the cows come into the

byre for the night, and get a little cut grass, tares, or other green food. The byre is arranged so that the cows have each a stall of about four feet wide, with their heads to the wall; and on the opposite wall the calves are tied up, two in a stall, exactly behind the cow, so that there is little trouble in putting them to the cow, and no chance of misplacing them. The fat calves have, in some seasons, been sold at L.5 each, this being the scarcest time of the year for veal."

But though formerly the *Angus cattle* were chiefly reared and fed in this district, and in the county generally, they have of late years been decidedly not the *favourite* stock. The superior weight and quality obtained by the feeding of short-horns have now rendered this description very generally preferred by the farmers of Strathmore. And certainly the make and points of the short-horns render them much preferable in general to the *Angus cattle* for the feeding-byre, though they require abundance of the best of keep and the most careful attention at all seasons. To those who have not at their command a plentiful supply of good keep and comfortable accommodation for feeding, the more hardy *Angus* ought to be preferred. To those, on the other hand, who possess these advantages, the short-horns will be found the most profitable feeders. It should before have been stated, that what are talked of in general as short-horns in this district are not the pure improved Teeswater, but merely crosses (generally with the *Angus*) with a large dash of Teeswater blood in them. In one or two instances, however, the pure short-horns are to be met with. Mr Hood at Hatton near Glamis, Mr Dalgairns at Ingliston, Mr Anderson at Newton, Mr Nicoll, Littleton, and Mr Campbell, Balbrogie, have all exhibited very superior specimens of the short-horned pure breed. Mr Anderson at Newton has probably now more *pure* short horns than any other breeder of them in the district.

Cattle for feeding are generally tied up for stall-feeding at the age of *three off*, but many even at two years. They are fed on turnips and potatoes, generally wholly on turnips

at first, then turnips twice a-day and potatoes once; and, as the turnips begin to get scarce, twice potatoes and once turnips. Often towards the end of the season cattle are fed wholly on potatoes. Of course, a bite of dry straw is constantly kept at their command. Fat cattle are generally ready for the market in March and April.

Having thus, though perhaps imperfectly, given some account of the live stock management of the district in reference to *cattle*, we shall, before concluding the subject, briefly advert to that of *sheep*.

It is now universally allowed that there is no manure which diffuses itself more equally, or which is more valuable in its effects than that produced by sheep, whether as applied on pasture land or in turnip feeding on the ground: farmers in this district are now so satisfied of this, that they almost invariably make a point of grazing their pasture-land one year with sheep, and of consuming generally the one-half of the turnip crop by sheep on the ground. It is an old remark that where you have plenty of sheep, plenty of *oats* follow.

There are comparatively few in the district who have it in their power to carry on a *breeding* stock of sheep, but there are some who do. Unless, indeed, considerable advantages of hill-pasture are possessed, a shifting stock of sheep will be found most profitable on a farm in this district. The mode of management generally adopted with a shifting stock seems to be this: a stock of ewes suited to the keep which the feeder may have for them, are bought in the autumn in middling condition, and put on turnips. They get the tup about the middle or end of October, and the lambs are sold fat off their mothers. The ewes are then fattened off the grass, and ought to be ready for the market about the beginning of September. If the farm affords a sufficiency of keep, sometimes a stock of lambs are bought in, fed through the winter, and sold off hoggs early in the grass season, after being clipt. The ewes bought in are often of the black-faced kind, and crossed

with a Leicester or Cheviot tup, produce a very heavy description of lamb. Cheviot lambs are often fed and sold as hogs, but the Leicesters are not quite so generally dealt in. The Leicesters are an expensive stock at first, and they do not seem to take the market like the other kinds, at least they do not so readily yield a profit proportionate to the outlay at first and expense of feeding. The high price of wool, however, of late years, has made a considerable difference in this respect.

We shall now offer some general remarks as to the district in question.

In contemplating the circumstances of an agricultural district, there is nothing which so naturally suggests itself as the state of *its roads*, and there is no subject connected with country matters now-a-days better understood than road-making. Our turnpike roads, both in this and the sister kingdoms, are unexceptionable, thanks to the labours and discoveries of Macadam. But simple though the subject now appears to us, there are few subjects which have given rise to more discussion and difference of opinion than road-making. Farey, Walker, Telford, Stevenson, Fry, Marshall, Paterson, and Edgeworth, all maintained their separate theories on the subject, but the superiority of Macadam's system, as a whole, is now almost universally acknowledged, and not less universally adopted. Since the introduction of his system, Macadam has made a most valuable improvement of it in the reduction of the size of stones laid on the road from 6 ounces to 4 or 4½. By the latter a much more angular stone is got, the stones consolidate more effectually in the road, and thus the bad effects of rainy weather are much lessened.

But it cannot be said that the improvement of our *parish* roads in Scotland progress in any thing like an equal ratio with the turnpike roads. If the present act of Parliament relative to the statute labour *is* to continue in force, a better system than that generally followed with our parish roads

might be adopted with advantage. In general, they are committed to the charge either of some farmer in the neighbourhood, or some common labouring man, either of whom is most probably allowed to lay out the road-money at his own discretion. In the one case the objection is, that the farmer, whoever he may be, will be so much taken up probably with his own affairs as to be unable to bestow that attention upon the roads which their importance demands; and in the latter case, as experience in many instances has shewn, the labouring man will very likely be grieve or foreman over other workmen belonging to some proprietor in the neighbourhood, and this man attends to the repairs of the bye-roads as a secondary consideration altogether, exactly as it may suit his own convenience, without regard to time or place.

Now, to rectify both these evils, we would propose that the bye-roads should in all cases be committed to the charge of the same individual who superintends the turnpike roads of the district. The trustees will no doubt take care that this individual be thoroughly conversant with his business, and as men *must* be constantly kept on the turnpike roads, how easy would it be for the superintendant to keep an additional man or two for the parish roads also. *This* would be the person most likely to make the parish road-money go farthest in keeping the roads in repair; and were this system more generally adopted than it is, we have no doubt a marked change would soon be perceptible in the parish roads in Scotland. In the Carse of Gowrie the system just alluded to has been adopted with the best results.

It is much to be feared, however, that, as the law now stands, really *good* bye-roads cannot be looked for. Let Government put them in a tolerable repair by levying a small temporary tax for the purpose, and afterwards put on a small toll at reasonable distances, and then bye-roads worthy of the march of improvement in other things might be ex-

pected. The bye-roads in this district are, by care and management, gradually getting into as good order as small funds will allow.

The whole scenery around this district of country is beautiful in the extreme. The extensive plantations of Lord Wharncliffe and Lord Douglas Hallyburton enhance the scenery not a little, and the numerous other gentlemen's seats in the district cannot but attract notice for the taste and neatness with which they are generally laid out.

But perhaps no gentleman, for a great circle round, has done nearly so much for a single estate, in proportion to its size, or in every possible way promoted a spirit of improvement in the county generally, as its present representative, Lord Douglas Gordon Hallyburton. For a period of not less than twelve years, Lord Hallyburton employed from eighty to a hundred extra labourers on *his* estate alone. His Lordship has accomplished many very arduous and extensive improvements in the way of draining, ditching, dyking, trenching, and planting, of which last, perhaps the most conspicuous and extensive, is the planting of his fine hills, forming part of the range of the Sidlaws. For an extent of more than 500 acres these hills are now covered with thriving larches, and on the east part of the property an extent of about 200 or 300 acres comes in, planted with hard wood of various kinds, much younger than the former, but mostly in a very thriving state. Through these hill plantations good carriage or cart roads are formed in every direction, which are not only valuable as affording most delightful pleasure-drives, but particularly so for the conveyance of the annual thinnings of the wood from the plantations.

There are now so many large larch plantations coming up in this country, that their proper management is a subject of some importance.

It is of the greatest consequence in the management of larch plantations of any extent, that every pains be taken

to keep the trees so dispersed over the wood as that each may be duly relieved from the oppression or crowding of its neighbour. This requires the plantations to be thinned every three years at least, until the wood arrive at maturity. The way in which this is best accomplished is by hiring in for the season an extra number of men and women merely for this operation. The best season extends from about the middle of May to about the 6th of August, because at that time the sap of the larch is in the condition best adapted for barking it. It is doubted by some whether the barking of the larch is either profitable or useful; but to those who so doubt we can confidently state that it is both profitable and useful; for it is profitable, inasmuch as it will, if properly managed, yield a return of about 20 per cent. upon the outlay; and it is useful, because it is of decided advantage to the wood to want the bark. The way in which the operation of barking the larch is carried on is this: females, in the proportion of about two-thirds of the number of males employed, are provided with small wooden broad-pointed chisels, shaped somewhat like a wedge, and an old dinner or large clasp-knife. These females and boys are stationed on the road, or part of the plantation most suitable for the after-carriage of the bark and wood, as near as circumstances may permit to where the men are thinning. Very frequently in working *up* the hill there is no way of getting the trees out to the road but by carrying them across men's shoulders, but where it is at all practicable it will be found to be a great saving to collect a number of trees together, hook them *en masse* in a drag-chain, and draw them out with a horse. A good steady horse soon gets accustomed to the work, and the saving of manual labour is great. The moment the trees are laid down on the road, the females and boys commence to peel the bark off them, by first taking the knife and making a cut up the middle of the tree; and then by inserting the wooden chisel, already noticed, in the slit

or cut previously made with the knife, the bark comes easily from the tree in one long sheet. It will then be the peeler's business to scrape the outside of the bark-sheet carefully with the knife, so as to clear it of the mossy stuff generally more or less collected on it, and also of the corky matter which is unavailable for tanning purposes. The bark is now conveyed to as airy a place as can be found within a reasonable distance, and there hung across booms, as the labourers call them, consisting merely of the thinnings of the trees, supported by three trees set up in the form of a tripod. These booms may be placed from eight to twelve or fourteen feet apart; and where a favourable place for a *depot* of bark is fallen in with, they are sometimes continued to a great length.

If the weather be dry, the bark will be ready for *turning*, in from ten days to a fortnight, and when completely *aired*, by being rendered as brittle as bone, it is conveyed to a house of some kind, where it is chopped into small pieces and made ready for sale and delivery to the tanner. Larch bark is chiefly used for sheep-skin tanning.

In thinning a wood, so many of the men are employed in cutting down the larches, and so many in pruning the branches from the trees before being carried out; and when the trees are to be barked, the pruner will be careful to lop the twigs close to the trunk, which will greatly facilitate the peeling of the bark.

In this district, as in most, the proper management of *pasture* lands is of very great importance, and there is no doubt that, on lands laid down either to permanent pasture, or for a series of years, something more might be done towards their amelioration than is generally attempted. On a property in this district, of considerable magnitude, about sixteen to twenty enclosures of pasture of various sizes are annually let for the grazing season, and in order to keep them in good heart a system of top-dressing is pursued

worthy of imitation on other estates, and which may here be shortly explained.

In the numerous, extensive, and thriving young plantations on the estate in question, there is annually a very considerable quantity of grass, which, from the growth of the plantations, cannot be depastured, and which, therefore, must either be cut or allowed to lie waste. The grass in these young plantations is regularly mowed every year and made hay of, the greater portion of which, however, is necessarily very coarse, and indeed ill adapted for any other purpose than that of litter.

In almost all the grass inclosures already mentioned, substantial and commodious cattle-sheds have been erected. The pillars which support the roof are of cast-iron, and cost about 10s. each. The roof is slated in the ordinary way, and the walls of stone, placed within the pillars and under the roof, are built dry, excepting at the corners and sconecheons. Two openings of six feet in width are left in the shed for the ingress and egress of the cattle.

With the coarse hay made as already described, these sheds are kept during the grazing season regularly *bedded*, and they prove a great acquisition to the pasture fields, since they afford shelter to the cattle in cold, rainy, or stormy weather, retreats through the night, or protection from the discomfort and annoyance to cattle of a scorching sun. At the middle and close of the season, these sheds are duly cleared out, and the manure is conveyed to some spot for a dung-hill, convenient for the field on which it may be intended to apply it. As soon after the cattle are all removed from the grass fields for the season as may be convenient, women and boys are employed to go over them and collect in heaps in the respective fields, by means of spades and wheel-barrows, the cattle and horse droppings. This is carted away to the dung-hill to be mixed with the manure from the sheds.

About the month of March, the dung-hill is carefully turned and mixed with the park dung, and any that is *rank* or long, well shaken out; and it is found of great advantage in preserving the essential properties of the manure, to cover up the dung-hill with a coating of good mould to the depth of about four inches. Between the months of March and August or September, a quantity of good earth is driven to the dung-hill, which there is never much difficulty in procuring, either from the scourings of ditches, foundations of houses or dykes, reducing of roads, or the like. About the month of August this earth is carefully mixed up with the dung in the proportion of three-fifths of earth to two-fifths of dung, and as soon as the field is clear, and the weather propitious for the purpose, it is applied as a top-dressing to the grass, in the proportion of 20 cart loads to the acre, each load containing about 30 bushels. This will be found not only a most effectual system of top-dressing, but as cheap a one as can well be devised, since there is no actual outlay but in manual labour. The cattle-sheds too are found to be a considerable inducement to graziers and others who rent the parks.

The *flora* of the district deserves a remark or two. The county of Forfar as a whole presents a diversity of surface, which renders the plants found in it of very varied description. Part of it is high, rocky, and mountainous, comprising a portion of the range of the Grampians on the north and north-west, and immediately to the southward of the valley of Strathmore, the Sidlaw range of hills rise in many instances to a height of 800 feet above the level of the sea. These high tracts of country, and more especially the former, taken in connection with numerous peat-mosses, afford favourable localities for many of the more rare alpine and bog plants. There is also a considerable proportion of the country low-lying, both arable and pastoral, with old plantations scattered over it here and there, in which much

moist land frequently occurs. This portion of the country contains many botanical advantages, such as undulation of surface, diversity of soil and climate, together with some extent of bleak moorland. There are also many fresh-water lakes and considerable rivers, such as the Isla, North and South Esk, Tay, &c., thereby affording habitats for many of the aquatic and lacustrine families of plants. The county likewise possesses the advantage of a sea-coast thirty miles in length, on and about which are found many of the marine genera and species. Viewing, therefore, these features, we think it reasonable to presume, that, on a more careful examination of the county than has yet been made, many discoveries may yet be made of known native plants, and probably some also quite new; and further, we cannot err far in saying that it will be found to possess as rich and varied a collection of native plants as any single division of Scotland. We may subjoin a few names of the rare plants found in this county. *Hippuris vulgaris* (mare's tail) plentiful; *Veronica Allionii* (creeping speedwell); *Utricularia intermedia* (intermediate hooded milfoil); *Eriophorum gracile* (slender mountain cotton grass); *Alopecurus alpinus* (alpine foxtail grass); *Phleum Michelii* (cat's-tail grass); *Arundo stricta* (smallest close reed); *Arundo arnaria* (sea-side reed); *Hierocloe borealis* (northern holy grass); *Poa alpina* (alpine meadow grass); *Avena planiculmus* (flat oat grass); *Hordeum maritimum* (sea-side barley); *Scabiosa columbaria* (small scabious); *Galium spurium* (smooth fruited bed-straw); *Potamogeton lanceolatum* (spear-leaved pond-weed); *Radiola millegrana* (all-seed); *Myosotis rupicola* (rock scorpion grass); *Azalea procumbens* (procumbent azalea); *Lobelia dortmanna* (water gladiole); *Atropa Belladonna* (deadly nightshade); *Tulipa silvestris* (wild tulip); *Ornithogalum luteum* (yellow star of Bethlehem); *Convallaria verticillata* (whorl-leaved Solomon's seal), found by Rev. J. Barty of Bendochy. *Juncus arcticus* (hard rush); *Juncus biglumis* (two-flowered rush); *Paris*

quadrifolia (herb Paris), found in the Den of Airly; *Subularia aquatica* (awl wort), found by Mr John Lowe, gardener at Hallyburton; *Sonchus cœruleus* (blue sow-thistle); *Hieracium cerinthoides* (honeywort-leaved hawkweed), and some others.

The geology of the district may merely be noticed in passing. The Sidlaw hills, which form the southern boundary, belong to the transition series, surmounted with trap. The rock through which the trap rises is the grey inferior sandstone, which, in some instances, contains vegetable impressions. The soil has not resulted from the disintegration of the adjacent rocks, but has been transported from another locality. The subsoil is a ferruginous clay. Details on this part of the subject will be found very ably laid down in Mr Buist's late most excellent paper on the geology of Forfarshire and Perthshire.

We must not conclude these remarks without adverting for a moment to the character of the *tenantry* of this part of the country, and certainly they cannot be spoken of in terms too flattering. For industry, intelligence, and respectability, no district can boast of a more desirable class of men, and none more ready at all times to give fair weight and trial to whatever may be put forth as an improvement on the agriculture of the country.

The rents of farms in many cases here are regulated by the fiars prices of the county, and different systems on this principle are followed. The principle upon which this system proceeds, is by supposing a certain price as a fair average per quarter of grain. The farm is valued first at a money-rent, and the amount, whatever it may be, is converted into grain at the price fixed. After this, the fiars regulate the rent, which is just the number of quarters of grain calculated for the capabilities of the farm multiplied by the fiars price, whatever that may be. Some fix a price beyond which the rent can never be calculated, and it may fall as low as the fiars in any year. Others again, fix a minimum, medium, and maximum. The medium is the supposed average rent of

the farm. The minimum fixes the price below which the rent can never fall; and the maximum that price above which the tenant can never be charged. Land in this district may be said to average about 32s. per imperial acre.

The peasantry of this district also demand our notice. They are, like the Scottish peasantry in general, a sober, hard working, quiet race. We think, however, that the system with the farm-servants here is not quite so good as in the Lothians and some other places. *There* each hind in general has a house and an allowance of potatoes, meal, &c. as part of his wages. But farm-servants in this quarter, unless they are married, are generally huddled together in what is called a *bothy*. Each man has his allowance of meal and milk; and brose constitutes his breakfast, dinner, and supper. It is sometimes alleged, and with some truth, that *the morals* of the farm-servants are not apt to be improved by the *bothy system*.

There is abundance of stone in the district, and the fences are in consequence generally most substantial. The farm homesteads too are remarkable for the varied accommodation which they afford, combining in an eminent degree all the conveniences necessary for the proper management of a tillage farm, with those most approved of for the purposes both of the breeder and feeder of stock.

NOTE IN REGARD TO THE DURABILITY OF ITALIAN RYE-GRASS. *By Captain HAMILTON, of Roxelle, Ayrshire.*

In spring 1834, Captain Hamilton sowed with Italian ryegrass, along with barley, a small part of a field of strong clay land on which turnips had been fed off with sheep. The rest of the field was sown down, with a crop, with a mixture of natural perennial grasses, costing 30s. per acre. The Italian ryegrass was mixed with a kind of small clover called ‘suckling’ in Surrey, which is much approved of as pas-

ture in that part of England, and continued remarkably green all winter. In spring 1835, a part of the field was inclosed for seed, and the rest depastured with cows and sheep, which were so fond of the Italian ryegrass that they preferred it to any other grass in the field, and kept it so bare that many of the plants could scarcely be seen. What was cut for seed was a thin and scanty crop, and both it and the pasture grew in tufts. In spring 1835, Captain Hamilton sowed several bushels of Italian ryegrass in these circumstances, 1st, on 2 acres with wheat and oats on stiff clay soil, which were allowed to carry seed in 1836, a scanty crop, and which in spring 1837 were very bare and in tufts;—2d, about $1\frac{1}{2}$ acre on light dry soil, sown with barley, which were depastured principally with sheep till spring 1837, when the herbage was any thing but a close stool of grass;—and 3d, about a rood without any crop, under the shade of trees, where the plants did not ripen their seed, but the herbage continued green until the winter of 1836. Part of the ground that was sown with Italian ryegrass in 1834 and 1835 was inclosed in 1837, and the grass allowed to grow uninterruptedly for some weeks; and the results were, of that sown in 1834 very little remained, and of that sown in 1835 about twice as much, but still very little. From that which was allowed to carry seed in 1836, 10 bushels of seed were obtained, the herbage of which was better than in the other two cases, probably from some of the seed sowing itself, but still it was a poor bare pasture, worse than on any part of the field sown with common ryegrass. There was also an indifferent crop from what was sown with wheat in 1836. In February 1837 Captain Hamilton sowed 3 acres of the lawn at Rozelle, in high order after potatoes, with 8 bushels of Italian ryegrass from the seed of 1836, but which was so bad in May 1837, that other grass seeds were obliged to be sown on the land, although it should be mentioned that March and April 1837 were unfavourable to the growth of ryegrass in Ayrshire.

Upon the whole results of his experience, Captain Hamilton is inclined to think that Italian ryegrass is not calculated to be so generally useful as was at one time expected,—that it certainly is not a perennial plant,—that as a crop it is not more durable than a biennial,—that it is not suited for permanent pasture, especially as live-stock are so fond of it, that they do not allow it to renew itself. He has no doubt, however, that it answers well as green cutting, when sown without a white crop, though, even in that way, it did not succeed with him in 1837.

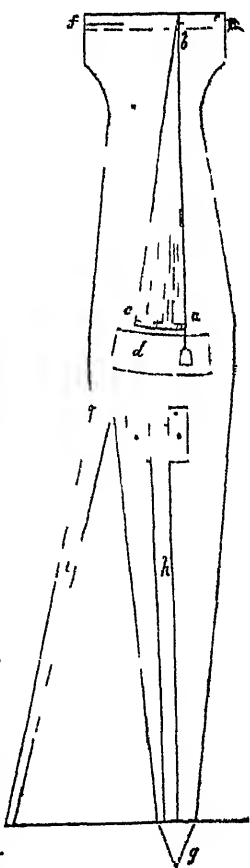
DESCRIPTION OF AN INSTRUMENT—"THE ROAD-MAKERS' AND DRAINERS' SECTOR,"—FOR DETERMINING THE SLOPE OF THE GROUND IN ROAD-MAKING, DRAINING, &c. *By Mr ARCHER, Road-surveyor, Tullybardine Cottage, by Auchterarder, Perthshire.*

In the 8th volume of the Transactions of the Highland Society, at p. 62, there is a description with figure of a very simple and efficient instrument for measuring slopes in road-making, &c., invented by James Hunter, Esq. of Thurston. Its construction is so simple that any carpenter may make it in an hour or two. Its accuracy is considerable, and the indicated slope is *read off* by simple inspection, requiring no aid of tables or calculation. In this instrument there appears one defect, it is not adapted to a great range of slopes, without, at the same time, becoming either more complicated or more cumbrous; for example, it is admirably adapted for slopes, ranging from 1 in 5 to 1 in 36, but without additions, or the aid of some other instrument on a different scale, it could not measure a slope of 1 in 100, at one observation.

An instrument for similar purposes, of a simple construction, has lately been brought before the Society by Mr Archer, of which the following is a description. It may be premised that it does not possess the extreme simplicity of the former,

whether in reference to construction or application, but it possesses the advantage of taking in any practicable degree of slope, at every tenth minute of a degree down to $0^{\circ} 10'$; but here it must be remarked, that in these low gradients, those who may adopt the instrument are not to expect perfect accuracy. It may serve for the slope of a drain, but could not be trusted for that of a mill-lead or the like. In the hands of the operative drainer, such instruments may be of much use; but in delicate levelling, the legitimate levelling instrument must always be resorted to.

Mr Archer's sector (See the annexed cut) is formed of a piece of well seasoned deal, about 4 feet in length, 10 inches in breadth, and $1\frac{1}{4}$ inch thick, fashioned off as in the figure, or it may be done according to taste. On the face of the board so prepared, a sector abc of a circle extending to 10° is to be laid down, and lines drawn at each degree, ab being the first or zero; these divisions are to be subdivided into six, each subdivision being thus equal to $10'$ of a degree: in the figure these subdivisions cannot be exhibited. An opening d is cut quite through the board to give freedom to the swing of the plummet, the latter being suspended by a fine cord from the point b . A tubular aperture is formed through the head of the instrument represented by the dotted lines ef ; a brass plate having a fine aperture is placed on the opening at e , forming the eye-piece, and at the opposite end f , cross wires are placed. A line passing through the intersection of the cross



wires and through the centre of the eye-hole, must be at right angles with the zero line of the sector. To enable the observer to place the instrument at the desired inclination, and that it may preserve its position, the point *g* is inserted in the soil; the jointed legs *h* and *i* are spread out and also inserted, *h* being used at all times to keep the instrument vertical in one direction, while *i* is employed to give the sight-line the desired inclination in the direction in which the slope falls. It is perhaps unnecessary to observe that the instrument, as here described, can only be properly applied in determining the slope by working towards the descent, and not the ascent.

Mode of using the Instrument.—Set the instrument as upright and steady as possible, with its head turned in the direction in which the slope is to be determined. An assistant marks the height of the instrument on a staff, and removing the staff to the point at which the difference of level is required, he sets up the staff in view of the observer; the observer then applying his eye at *e*, moves the head of the instrument backward or forward, until the cross hairs coincide with the mark on the staff. The plumb-line will now mark the degrees and minutes of the inclination; these are to be noted, and, by consulting the table, the fall will be found in terms of the length,—thus, suppose the plumb-line to fall upon 7° ; in the table, and opposite to this will be found 8, indicating a fall of 1 in 8, or one foot perpendicular in eight feet of length.

The following table furnishes by inspection the fall corresponding to various angles from $10'$ to 10° .

10 min. is a fall of 1 in 343.8	1 deg. 0 min. is a fall of 1 in 57.3
20 min. . . . 171.9	1 deg. 10 min. . . . 49.1
30 min. . . . 114.6	1 deg. 20 min. . . . 43.05
40 min. . . . 85.95	1 deg. 30 min. . . . 38.2
50 min. . . . 68.8	1 deg. 40 min. . . . 34.4

1 deg. 50 min. is a fall of 1 in 31.3	4 deg. 30 min. is a fall of 1 in 12.8
2 deg. 0 min. . . . 28.7	4 deg. 40 min. . . . 12.4
2 deg. 10 min. . . . 26.5	4 deg. 50 min. . . . 11.9
2 deg. 20 min. . . . 24.6	5 deg. 0 min. . . . 11.5
2 deg. 30 min. . . . 22.9	5 deg. 20 min. . . . 10.8
2 deg. 40 min. . . . 21.5	5 deg. 40 min. . . . 10.1
2 deg. 50 min. . . . 19.95	6 deg. 0 min. . . . 9.6
3 deg. 0 min. . . . 19.1	6 deg. 20 min. . . . 9.0
3 deg. 10 min. . . . 18.1	6 deg. 40 min. . . . 8.6
3 deg. 20 min. . . . 17.2	7 deg. 0 min. . . . 8.0
3 deg. 30 min. . . . 16.4	7 deg. 30 min. . . . 7.6
3 deg. 40 min. . . . 15.6	8 deg. 0 min. . . . 7.2
3 deg. 50 min. . . . 14.95	8 deg. 30 min. . . . 6.8
4 deg. 0 min. . . . 14.3	9 deg. 0 min. . . . 6.4
4 deg. 10 min. . . . 13.8	9 deg. 30 min. . . . 6.0
4 deg. 20 min 13.2	10 deg. 0 min. . . . 5.76

ON THE GRANITE OF ABERDEENSHIRE. *By Mr RODERICK GRAY, Peterhead.*

THE granite of Aberdeenshire is of excellent quality—is inexhaustible—can be raised in very large blocks, and is of great variety in the distribution of component parts and shades of colour; it admits of a fine polish, and no alteration takes place in the polish for an indefinite length of time.

The splendid pillars in the British Museum, and in the Fishmonger's Hall, London, were taken from quarries in the neighbourhood of Peterhead, where granite of excellent quality, and resembling more than any other the red Egyptian granite, is to be found in large masses and in quantities quite inexhaustible. These pillars were carried to London in a rough state, and polished at great expense.

Mr Alexander M'Donald, stonecutter, in Aberdeen, polished granite to a considerable extent and in a superior manner by manual labour, and the red granite from Stirlinghill to Buchanness and Peterhead was generally preferred. About two years ago, Mr M'Donald invented machinery for polish-

ing granite by steam, and, at very considerable expense, erected works for that purpose, which have been attended with greater success than he anticipated, and have been in constant operation.

He has brought the polishing of granite to a state of perfection, which, previous to the erection of his steam-engine and machinery, could not have been expected. He is a very enterprising individual, and is confident of being able to bring his works to a greater degree of perfection at no distant period. He has already succeeded in executing flat and circular work in a superior manner.

There can be no doubt that granite will be extensively used when it can be procured at a moderate price,—and he must be considered deserving of the goodwishes and encouragement of his country, who brings into operation any means whereby this most abundant and durable rock may be made to give employment—may be converted not only into useful, but also into ornamental purposes, and at such expense, with the aid of machinery, as to bring it within the means of a greater number of purchasers. The expense of polishing granite is much lessened by the application of steam compared with what it was by manual labour, while the work is executed in a much superior manner.

DESCRIPTION OF A TURN-WREST, OR RIGHT AND LEFT MOULD-BOARD PLOUGH. *Invented by JAMES WILKIE, Uddingston, near Glasgow.*

[Ten Sovereigns.]

The Directors of the Highland and Agricultural Society having, at the suggestion of one of its members, an eminent agriculturist, offered a Premium of Ten Sovereigns for a Plough constructed “to facilitate the subsoil and trench ploughing of land of great declivity, where it is of importance, as economizing labour, to plough at

right angles to the slope, with a plough mounted with a mould-board or mould-boards, capable of shifting with facility, so as to throw the furrow slice either to the right or left, that it may always be turned in the direction of the natural slope." The premium to be awarded to the plough that should fulfil those conditions in the most efficient manner; the competing ploughs to be exhibited and proved by trial at the General Show at Glasgow, in 1838.

An unusual degree of interest seems to have been excited by this premium, as on the day of competition, no fewer than seven ploughs started for the premium, all possessing, in a greater or less degree, the properties required in the specification, and most of them exhibiting ingenuity of construction, and examples of good workmanship. After repeated trials of actual ploughing, and careful investigation of the results by the judges, the premium was awarded to James Wilkie, agricultural implement maker, Uddingston. A plough very similar in principle and construction, invented by Mr Smith of Deanston, was the second best, and came very close upon the first. Though a plough on this principle is not in itself new, yet the attempts hitherto made in constructing Turn-Wrest Ploughs seem to have been but imperfect; and it has been suggested that a well constructed plough of this kind might, in some situations, be advantageously employed in preference to the common plough; and moreover, that it might be adapted to perform both common and subsoil ploughing, which at present can only be effected by means of two separate implements.

In describing Mr Wilkie's right and left plough, the frame-work of it may not inaptly be compared with the common double mould-board plough—the beam and stilts of the former being joined much in the same manner as is usually done in the latter—that is, the beam, instead of forming a continuation of the land-stilt, is set in a central position to the two stilts, as will be seen in the figures,

where fig. 1 is a geometrical plan, and fig. 2 an elevation. That part which may be called the body of the plough, is a light frame welded to, and forming part of, the beam, but not seen in the figure. The sole bar of this frame, like the common form of Mr Wilkie's plough, terminates forward in the head for carrying the share or sock. In the plough under consideration, the share has no feather on either side, but terminates in a chisel point, about $1\frac{1}{2}$ inches broad. Both sides of the body, behind the share and breast, are covered with plates similar to those on the land side of the common plough, and in this case form the right and left land side plates. The body thus constructed is slightly wedge-shaped, about $1\frac{1}{2}$ inches thick forward, and 2 inches

Fig 1.

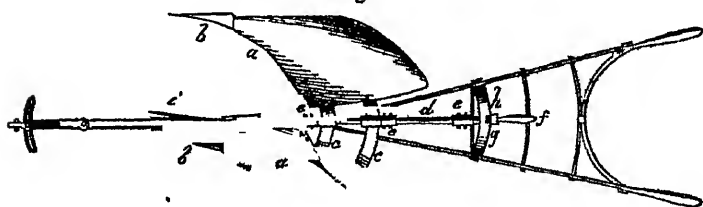
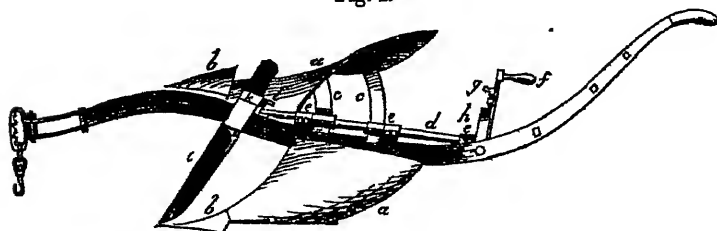


Fig. 2.



behind. The coulter, *i*, is placed in the same position which it occupies in the common plough; but here, there being two land sides, it is so fitted as to be applicable to take the true position on either side of the share. In effecting this adjustment, Mr Wilkie has adopted a very ingenious method. The coulter hole has its ends cut parallel to each other, but its sides diverge upwards; the neck of the coulter is made to fit the hole before and be-

hind, and to fit it sideways also at the lower edges ; but from the divergence of the sides of the hole, the coulter is at liberty to be swung from side to side, to an extent equal to the divergence of the hole, which is so regulated, that the point of the coulter shall just swing the breadth of the share, or $1\frac{1}{2}$ inches.

As regards the mould-boards *a, a*, of this plough, the right-hand one is of the common form used by Mr Wilkie, while the left-hand one bears the same dimensions and curvature, but placed in a reverse position, twisting to the left instead of the right hand. For the management of the two mould-boards, an iron shaft or spindle *d* is supported in bearings *e* attached to the beam. The spindle carries two sets of arms *c*, which are kneed at the extremities, to fit the mould-boards, when they are respectively in their proper working positions, and to these kneed arms the mould-boards are severally fixed with bolts. By this arrangement, when one mould-board is in the working position, the other is elevated so as to be entirely free of the furrow. The arms, being placed on the spindle so as to extend to an arc of 180° from each other, will effect this, but the plough will be better balanced were the inferior arc extended to 200° or 220° . Each mould-board has the feather *b, b* of the sock bolted upon it, and removable at pleasure for sharpening or dressing ; and when either mould-board is brought down to its working position, the straight side of the feather applies close to the side of the permanent sock, forming thus the entire member nearly similar to that of the common plough.

The change of position of the mould-boards is effected by the ploughman turning the crank handle *f* of the spindle *d* from one side of the arch *h* to the other, where the handle is respectively locked by the little slide-bolt *g* until the mould-board is again shifted. When the plough is required to move with neither of the mould-boards in action, the bolt *g* is locked into an intermediate notch of the arch by which both are held in the air, suspended at equal heights from the ground. In this position it is that the plough has been pro-

posed to act as a subsoil plough, taking alternately, a furrow in this last state, and in that with a mould-board down.

The operation of swinging the coulter from the one side to the other is performed simultaneously with the shift of the mould-boards, and is thus produced. The spindle *d* is prolonged forward until it enter into the box *k*, attached to the head of the coulter. On the extremity of the spindle is formed an eccentric stud or detent, which, acting in a corresponding recess in the interior of the box *k*, throws the coulter to either side alternately with the mould-boards, holding it fast by pressure against the side of the hole, the point of the coulter being always thrown to the side opposed to that on which the acting mould-board has been let down. In this way the coulter is always in the plane, or nearly so, of the land side, as in ploughs of the common construction. The right and left plough differs in no other respect than in the points here described, from the common plough, the dimensions of all the parts, their positions, and the draft gearing, remaining the same as usual.

There being still a great diversity of opinion amongst ploughmen as to the most perfect form of the plough and its parts, more especially the form of the mould-board, and each district of the country holding its own cherished form as the perfection of the plough-maker's art, it may be of importance to those holding such various opinions, to be informed, that the construction of the right and left plough is not confined to any particular form. All that is necessary is to have an exact reverse of the mould-board of the district, and, when the fore-part of the mould-board is much truncated or shortened, that both the right and left be lengthened out in that part to the extent of four or five inches, so that a small feather may be bolted upon it. The draft, the work performed, and the manual labour required for such ploughs (with the difference of a little extra weight), will be nearly the same as in the common implement.



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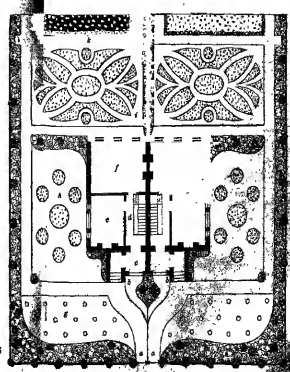
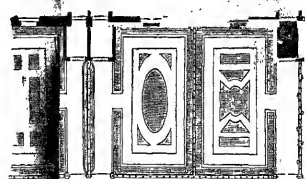
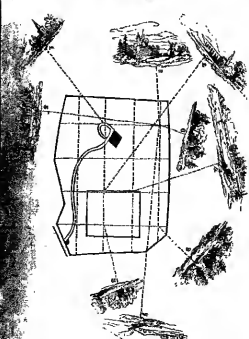
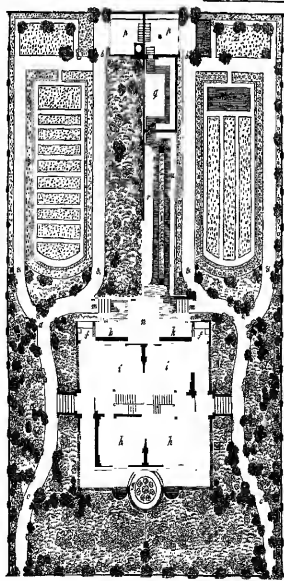
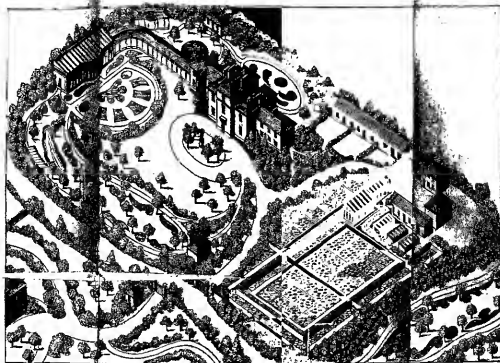
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REPORT OF THE EMBANKMENTS AND FERRY PIERS ON THE
ESTATE OF TULLIALLAN, NEAR KINCARDINE, IN CLACK-
MANNANSHIRE.

Drawn up by Mr WILLIAM MENZIES, Factor on that Estate, by desire of the Trustees of the late Lord Viscount Keith, and transmitted to the Society by JAMES LOCH, Esq. M. P., one of the Trustees, with a letter in the following terms :—

“ 12 Albemarle Street, 3d July 1838. ”

“ SIR,—I beg, in the name of the trustees of the late Viscount Keith, to transmit to you, for the information of the Highland and Agricultural Society of Scotland, an account of two very considerable embankments, and of several other improvements which have been executed on the estate of Tulliallan, near the town of Kincardine, upon the Frith of Forth.

“ This report has been prepared by Mr William Menzies, the factor upon the estate, who is already favourably known to the Society for his judicious and successful experiments in laying down land to permanent pasture.

“ The extent of these works, the trustees apprehend, are of sufficient magnitude to justify them in applying for the premiums which have been offered by the Society for reclaiming land from the sea, and for reclaiming land by embanking rivers,—the quantity reclaimed far exceeding the limit set forth in the list of premiums circulated by the Society. It is the wish of the trustees, in submitting their claims for these premiums, that whatever may be bestowed by the Society, should be conferred on Mr Menzies, under whose directions, and through whose exertions, and owing to whose judgment, the greatest portion of these improvements have been brought to a successful termination, whereby a larger extent of rich alluvial land has been gained from the sea, than by any other similar work in Scotland.

“ It is hoped that the success of these works may induce others

on the Frith of Forth to follow a similar course where there are the means of adding a great extent to the productive power of the country, in the same manner as has been done in former years along the whole course of the Thames from London to the Hope, and at the same time with advantage to its navigation. I am your faithful Servant,

“JAMES LOCH.”

“*Sir Charles Gordon.*”

In obedience to the directions of the trustees, I forward a short account of the formation of the embankments, and of the Ferry piers on the estate of Tulliallan, near Kincardine, on the Firth of Forth, which were partly executed by the late Lord Keith, and which have been completed since his death by his trustees, in fulfilment of his directions to that effect :—

1. The west embankment is the first in order. It encloses a bay between the town of Kincardine and Kennetpans, on which the spring-tides rose eight feet in the line of the embankment. It was commenced by Lord Keith in April 1821, and was finished by the end of the summer of 1822. It is entirely constructed of mud, wheeled with barrows from both the outside and the inside of the site of the embankment. It is covered on the sea-face with salt grass-turf, and formed on an average of 11 feet 6 inches high, and 4 feet broad at top, with a slope seaward of 3 feet horizontal to every foot of rise, and on the land side 1 foot 6 inches of slope to every foot of rise.

The extent of this embankment is 2020 yards, and encloses 152 imperial acres. It crossed three water runs, which were very soft and difficult to erect the bank on; and towards the west end the mud was mostly a new deposite, which slid down so often as nearly to baffle every effort to keep it up. At first no brushwood was used in the construction of the work, but it was found afterwards to be impos-

sible to erect the bank where the mud was soft without it. During the time of its construction four openings or *slaps* were left, thirty yards wide each, for the ebb and flow of the tide; these were afterwards reduced to two. An attempt was made to close these two, in the autumn of 1821, but without success; they slipped out four times, and it was found impracticable to fill them up until the bottom of the openings were strongly piled and brush-warped, which was done in the spring of 1822.

For carrying off the land water, two tunnels of larch-wood, with valves of the same material, were constructed at proper distances in the base of the embankment. These were afterwards found to have been placed too high to effect the drainage, and were replaced by one tunnel of the same wood, 8 feet by 2 feet 6 inches, fixed in a situation between the two first and at the level of the low water of ordinary neap-tides.

This tunnel answers the general purpose very well, requiring, however, close attention, to prevent the valves being kept open by rubbish of any sort which may happen to pass through the tunnel. The whole embankment subsided considerably in the course of erection, and in some particular places this continued very much for a considerable time afterwards. It was heightened in 1823, and again a considerable portion of it had three feet added to its height in 1824, and the same was found to be necessary at different periods up to the year 1836.

The principal errors in the construction of this embankment were the back slope being too steep, and the sea-face not having stones to protect it from the wash of the waves which carried off the turf, thereby occasioning a great expense in replacing them. The want of stones also occasioned a considerable expense in the construction of brush warpings for a protection. These consisted first of small ones erected perpendicular to, and afterwards a strong upright one parallel with the bank, to the height of high-water spring-tides; these proved inef-

fectual, and the breaches made in the embankment had to be faced with stones, which work is still in progress, and will be continued till the whole seaward slope is made secure. During the time of erection, the not securing the bottoms of the opening left for the ebb and flow of the tides was also a great error, by which the mud which had accumulated within the line of the embankment, was run away so deep as to render it nearly impossible to fill them up, so as to bring them to their proper level; indeed, the last had to be filled up from the inside, thereby lowering the surface of the accumulated mud so much, as to render from two to three acres nearly useless.

The expense of this embankment up to the end of 1823	
was	L.5021 3 10
To the end of 1826,	1082 16 9
	<hr/>
	L.6104 0 7

besides several considerable repairs since, some amounting to several hundred pounds.

The mud or alluvial soil over the whole of the space thus reclaimed from the sea is of very great depth, and of very excellent quality. It was necessarily very fully impregnated with salt, so much so as completely to impede, for two or three years, any sort of vegetation.

In most places within this embankment, beds of the ordinary sea-shells, such as oysters, cockles, mussels, limpets, &c. are still to be found four feet under the surface. The first appearance of vegetation was in 1823, a year after the tide was shut out, when the *Poa maritima* and *Aster tripolium* began to take possession of the general surface of the mud, and the *Agrostis stolonifera* and *alba* along the course of the fresh-water runs.

In 1823 the ground was divided into fields of from 14 to 17 acres with ditches; and in 1824 it was, for the greater part, wedge drained at the distance of 18 feet between each

drain. A crop of oats was sown over the whole, a great portion of which never grew, and the produce fell very far short of the seed sown. In the beginning of the ensuing year, 1825, the whole of the reclaimed land, with the exception of one field kept for cropping, was sown with rye-grass and white clover, mixed with some other grasses. This was repeated in the after part of that year, and also on the following season, 1826; this being a very dry season, the grasses did not succeed well, but the following season, 1827, the grass was good and continued to improve until 1830, when the fields thus sown down began to be broken up in rotation, for oats, barley, potatoes, beans, wheat, and clover-grass, which has been the rotation of crops pursued ever since. The wheat was good in quality, but deficient in quantity, and straw, potatoes, and barley very good; beans, oats, and clover-grass excellent, almost unequalled. The field which was not sown out in grass with the others, was cropped with oats, barley, beans, grass, oats, potatoes, barley, grass, &c. in rotation; these crops were very deficient at first, but continued to improve progressively as the salt was extracted by cultivation; it has, however, not been equal to the other fields which were sown down, in the first instance, to grass and pasture. Commencing with grass, seems to be by much the cheapest and best method for extracting the salt from lands thus reclaimed from the sea, the over quantity of which seemed to be the cause of barrenness at first, and it became productive in proportion as the salt was extracted from it. Sheep and cattle thrive uncommonly well on these fields while they were in pasture, and both the grass and bestial pastured thereon improved as the fields advanced in age.

The rent of this land reclaimed from the sea was progressive for the first six years, when it became fixed at three bolls of grain, wheat, barley, and oats, one of each per acre, the value of which paid in money by the highest fiars prices of the county of Perth.

The cost of cultivation cannot be easily ascertained, the reclaimed land being worked along with 100 acres of strong carse clay, which is much more expensive to work ; it may, however, be stated at about the same expense as that of dry alluvial, or turnip soils.

2. The Ferry Piers were next executed, and commenced in the spring of the year 1826, by the building of a low-water pier or slip of stone on the Kincardine side of the Forth, extending from high water into the river 239 yards, where there is 6 feet of water at the lowest spring-tides. This pier is 45 feet broad, with a basin constructed at the upper end of it, for the purpose of washing the mud off, and keeping the sides of it clean ; and exactly opposite to this stone pier, and on the south-west side of the Forth, in the year 1827, the construction of a low-water pier of Scotch fir and larch timber was commenced, 40 feet broad, and extending into the river to a point, where there is 7 feet of water at the lowest ebb of spring-tides, its length being 256 yards. This pier is connected with the land by an embankment of mud 186 yards in length, upon which a roadway is constructed, making the united length of pier and embankment 442 yards from high water to the outer point, leaving between the points of the two piers 426 yards of clear river way. This pier was the third that had been erected near this site during the space of a very few years ; but in consequence of the constant and rapid accumulation of mud, where any obstruction was erected on the south side of the river, the two which preceded had become quite useless for the purposes of the ferry. It became necessary, therefore, to erect this pier on piles, which were driven in, in rows parallel with the current of the river, 8 feet apart, row from row, and three feet, pile from pile. The platform was constructed of run beams fastened to the top of the piles and covered with three-inch planks placed across the pier, secured with tree-nails and iron bolts to the beams,—the whole was covered with ironstone-slag from the

Carron Works, which consolidated into one mass, and forms an excellent roadway resisting the wash of the sea. The piling has suited extremely well, admitting a free run for the tide, and effectually preventing a deposite of mud near the pier, which is thereby kept clear at all times, and a sufficient depth of water for the Ferry purposes preserved.

These piers were finished by the end of the summer of 1828, and have afforded ever since, excellent accommodation to two large and powerful steam-boats drawing 6 feet of water, which are enabled to ply at all times of tide, and in all states of the weather. The cost of them were as follows :

Stone pier, north side,	.	.	.	L.3837	4	1
Timber pier, south side,	L.2091	7	5			
Mud bank and road at						
root of timber pier,	539	14	3			
					2631	1 8
Sum total,	.	.	.	L.6468	5	9

Projecting as they do considerably into the river on each side, the rapidity of the tide in the line of the Ferry appears to be considerably increased ; the bottom, however, being hard, very little difference has taken place in the depth of the water.

3. Brushwarping connected with the pier on the south-west side of the Forth, at a distance of 186 yards from the shore, where the roadway embankment and the open-piled timber pier join, consisting of two double rows of piles warped with brushwood, was erected. The distance between these two rows, is 15 feet, the inner row being 7 feet and the outer 5 feet above the then surface of the mud. They are put up in a direction parallel with the course of the river. This was done in the same year that the pier was commenced. The object was to catch the mud, with which the river water is highly saturated, and to raise the space within sufficiently

high to be embanked, and to form at the same time the base of a future embankment. This operation has completely answered the purpose intended. The accumulation of mud has been very great, namely, to the extent of 7 feet deep over almost every part of the space thus enclosed within the brushwarping. It is now above the level of the high water of neap-tides, and mostly covered with the salt grass, *Poa maritima*. The expense of this operation was L 113, 11s. Sterling.

4. Longannet Embankment.—This work is situated on the east side of the shipping pier of Kincardine, stretching from thence to within a short distance of the rocks at Longannet Point, at which point it reaches the shore at the quarry; the whole length being 3046 yards, or about 1 mile and three-fourths of a mile.

This embankment runs parallel with the current of the river, at the distance of 100 yards on an average from the low-water mark of spring-tides, and encloses a long flat bay formed by the two points of Longannet and Kincardine, measuring about 214 imperial acres. Over this space the spring-tides rose at the end next to Longannet, 11 feet 6 inches, and on that next to Kincardine 7 feet. The soil is a deposit of mud, in some places to a very great depth, and nowhere less than 15 feet. The original alluvial soil, a deposit from the river, is of very tough strong texture, the more recent deposit much lighter and mixed with peat-moss.

The embankment is constructed of stone rubbish and rubble stone on the outside, and of mud within; the mud was chiefly taken from the sea-beach on the outside of the bank.

The seaward slope is two and a half feet horizontal for every foot of rise, and the inside slope is two feet horizontal to every foot of rise; the breadth at the top is four feet, and the height from sixteen feet six inches to twelve feet.

The work commenced in the spring of 1829, by forming a bank of stone, rubbish, and rubble stones, obtained

from Longannet quarry, commencing at the high water of spring-tides. By means of a railroad it was carried along towards Kincardine, during that and the two following years, about 900 yards, at a level of about two feet above the high water of spring-tides, the breadth of stones at the base, where the bank was full height, being fifty feet. Behind this embankment of stones the base of the mud bank was formed at the same time, and raised to the height of eight feet; and connected with this portion of the work is a jetty for the shipment of stones, and one of the *slaps* or openings sixty yards wide, which was left for the ebb and flow of the tide. In this portion of the work also, there is placed one of the tunnels intended for the discharge of the land water. The 900 yards thus erected having reached the point where it is less exposed to the heavy seas from the south-east, and where it does not require so strong an embankment of stones, the railway was not extended farther; and a punt or lighter boat, carrying forty tons of stone at a time, was substituted to carry the stones from the jetty to the rest of the work. For the next five years, until 1836, the work went on in this manner progressively, so as to allow time for the low parts to silt up with mud, and to rise to the height wished for. By the end of that period, a ridge of stones, thirty feet at base at the highest place of the bank, to twenty feet of base at the lowest, and averaging eight feet high, was laid down from where the railway ended up to Kincardine Pier.

By the middle of the summer of 1836, the mud had risen along the lowest parts of the ground within the railway portion by a deposit of mud as much as seven feet nine inches, by which it had accumulated above the level of high water of neap-tides. It was now considered that the time had arrived when the mud embankment should be formed behind the stones, and when the work should proceed more rapidly, with the view of shutting out the water, and finishing the work. This part of the work was commenced in the summer

of 1836 at the place where the railway portion ended, and it went on regularly until the closing of the tide *slaps* or openings, which took place in January 1838. These openings were left, while the rest of the embankment was constructing, for the ebb and flow of the tide. They were five in number, of different breadths, from 120 yards to 60 yards. The bases of them all were raised above the general surface by at least two feet. The mud portion of this part of work, which was exposed to the rapid and powerful action of the tide while flowing either way through these openings, was well secured with brush-wood, and the stone part of it was carefully laid and wedged down in the form of a causeway, to prevent the run of the water carrying out the bottoms. A number of temporary tunnels were also placed in different situations at proper heights, to aid in drawing off the tide-water. Besides which, a second permanent tunnel for the escape of the land-water, and drainage of the soil to be reclaimed, being placed in May 1837 near the upper end of the embankment, it was used also for drawing off the tide-water. This at one period, when the embankment was low, it was of importance to accomplish as early after the fall of the tide as possible.

Very little progress was made with the mud bank in 1836, but a great effort was made in 1837; and the whole, excepting the openings, was completed by the end of that year to the height of two feet above the high water of spring-tides, and secured on the outside with stones from the quarry by the punt-boat.

I may here mention, that it became necessary, in the month of July 1837, to shut up one of the tide-openings, the fourth in number from Kincardine Pier, in order to aid more effectually the mudding up of this portion of the area within.

By the 20th of January 1838 it was determined to shut up other two of the openings, namely, the one first left at Longannet, and the third downward from Kincardine Pier; but it was determined at the same time not to shut up the two

remaining openings until the months of April or May 1838, while those which it had been resolved to close were in progress for that purpose. Circumstances occurred which forced on a different determination; the river, in the month of January, was full of floating ice, with heavy gales of wind from the east, which threatened the destruction of the new raised mud-bank within. To save this from the combined effects of the wind and ice, it was immediately resolved to attempt shutting up all the four openings at once, and thereby to exclude the tide. This operation was commenced on the 22d January, and the whole of them were completed above the reach of the then spring tides by the 26th of the same month. The workmen, during the space of five days, exerted themselves day and night, in the face of a furious storm of snow, light being got during the night by means of coal fires. As soon as the openings were shut up, the men were employed, and have been ever since occupied in heightening and adding breadth to the mud embankment, where wanted, and it will require the greater portion of the ensuing summer to complete the work. A farther heightening in some places, and more breadth in others, will have to be added. The back of the bank will have to be dressed up, ditches cast to dry the soil will have to be followed by draining to get out the salt, which will be even stronger here than in the upper embanked ground.

The cost of this work, from the commencement to the end of February 1838, was L.11,959 : 7 : 7, and it will still take above one thousand pounds to complete it.

In the rail-road portion of the embankment, there are about 90,000 tons of stones and quarry rubbish, and in the other portion, where less were used, there were about 80,000 tons, and some more are still required to complete the work.

It may here be observed, that the stones settled down a great deal in the course of erection,, in soft places five feet, in the course of two days.

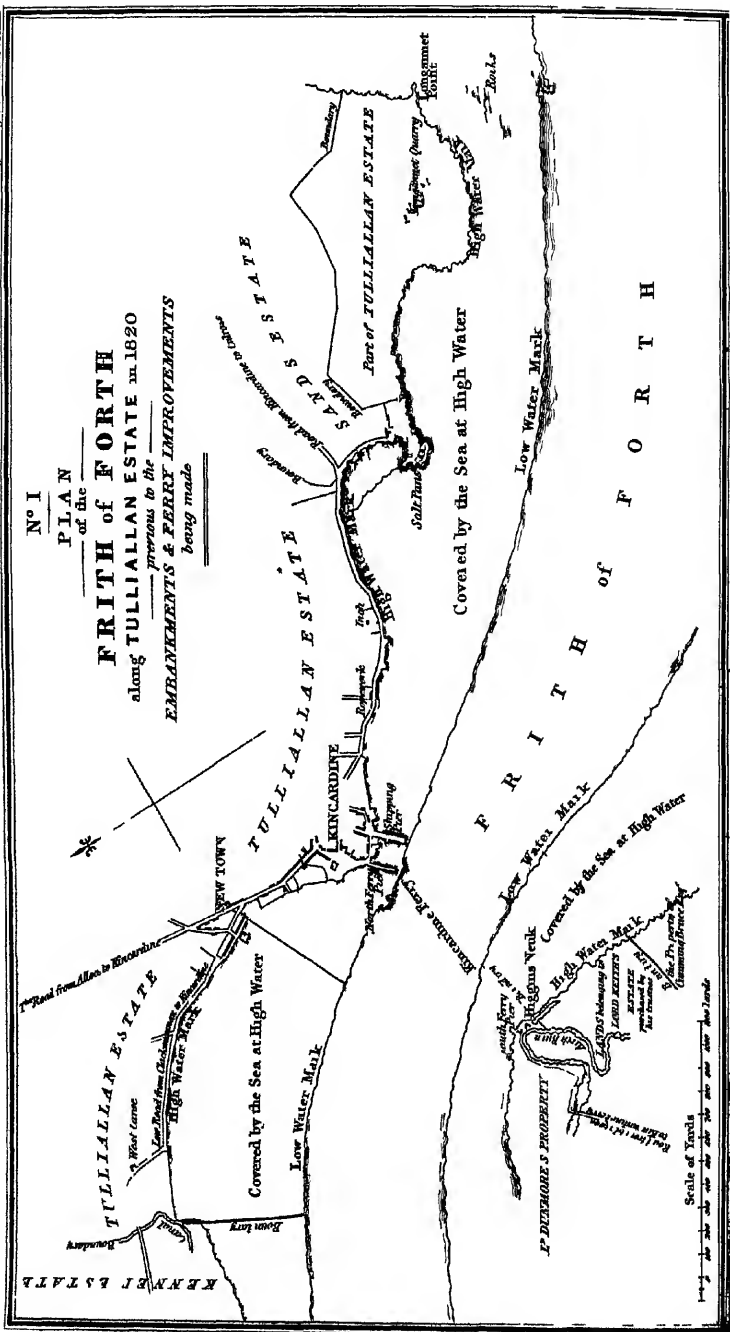
The river is in general very full of mud, and where the

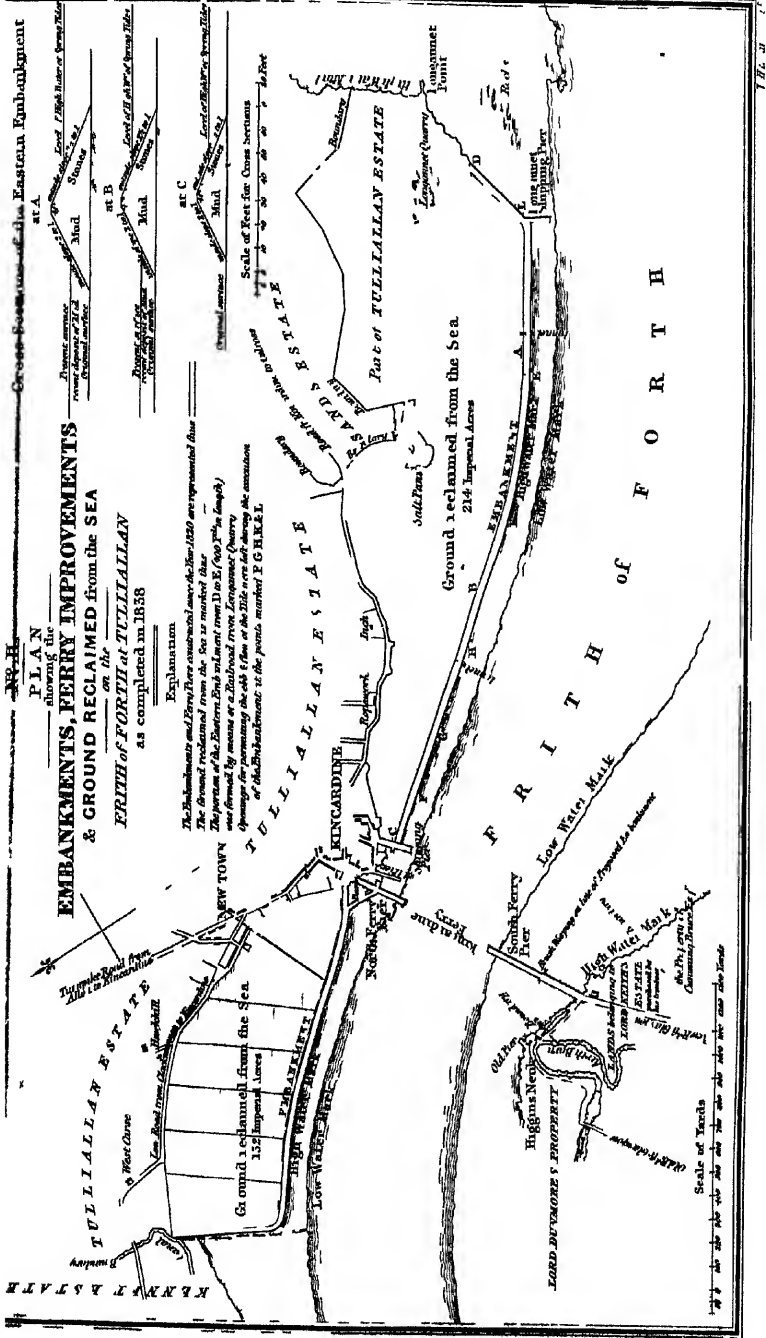
water is made still, the déposé is very great, and the rise of the surface accordingly very rapid.

In some places there was a great difficulty in procuring material for the erection, the mud being a new déposé, a considerable quantity of brushwood and heather had to be used to bind it, and to keep it from sliding ; the difficulty and expense also were rendered great from the short time for work during each tide, the embankment being as close to low water-mark as could well be got.

The tunnels and tide openings were a very important part of the embankment.

The tunnels are two in number for the drainage of the land after it is reclaimed, the one is constructed of hewn stone, closely jointed, and laid on a platform of wood, which platform is laid on piles properly driven in ; the other tunnel, made of beech-wood, is well and securely fastened, and laid on a piled platform. Each tunnel is three feet wide, by two feet six inches high, with an outer and inner valve ; the outer valve, which is the principal one, being constructed so as to shut flat on the face, they have proved very tight, and are the only ones we have found so ; and both were laid to the level of low water of ordinary neap-tides, and the water-way secured by a piled channel from the mouth outwards. The bottom of the tide-openings were raised above the surface of the ordinary mud-déposé, in order to aid the future deposition inside ; and to afford a good foundation when it became necessary to shut them, they had to be well secured and watched with great care, as the smallest run of water once begun might have taken the bottoms out, and might otherwise have occasioned much damage before a repair could be made. These openings were contracted previously to shutting them up ; and the base, to prevent slips, had two double rows of piles, at the distance of ten feet asunder from each double row ; these rows being warped with brush, and strongly supported with spars on each side, were four feet high. The slaps were brought





to the full height at once, and have not slipped in the least degree, neither have they settled down very much.

It may be observed, that the line of this embankment is very long, the height of it very great, and the expense necessarily also very great, for the quantity of land reclaimed. The attempt was hazardous, it would not have been made, at least with any prospect of success, without the command of so much stone conveniently situated.

There are large tracks on both sides of the river, but especially on the other side of the Forth, connected with the small portion of the Tulliallan estate, at the South Ferry Piers before mentioned, which, I am informed, amounts to 1700 acres of very superior mud; this track, from the great breadth of the ground, requiring comparatively a short embankment, might be reclaimed at an expense proportionably less than that of Longannet, which besides being a great improvement to the river by contracting it, and thereby deepening the channel, would be of much advantage to the navigation.

I have subjoined two sketches of part of the river Forth, No. I. Plate X., before the embankments and improvements of the Ferry took place, the other, No. II., shewing these embankments and improvements as executed in 1838. Reference to the plate will render the above description sufficiently intelligible.

ACCOUNT OF EXPERIMENTS MADE WITH SOME OF THE RARER GRASSES AS A SUBSTITUTE FOR TARES, OR THE FAILURE OF AFTER-MATH. *By Mr THOMAS BISHOP, Land-Steward, Methven Castle.*

The *Poa nervosa*, or Hudson Bay meadow-grass, of which I claim the merit of introducing into the agriculture of Scotland, was first received by me from Mr Stuart Murray, Curator of the Botanic Garden, Glasgow, about eight or nine years

ago, amongst some other grasses recently received from North America. Perceiving it to retain a freshness during the severity of winter,—to rise earlier in the spring,—and on being cut over, to reproduce leaves and flower-stems with a rapidity far exceeding the many other species which I had in keeping, induced me to extend its cultivation by itself, and in mixture with other pasture grasses. I have sold and given away seeds of it to several individuals, who have found it to possess all the requisites of an excellent pasture grass.* The *Poa nemoralis angustifolia* is the nearest allied to it of any of the British grasses, but from which it differs widely in the general habit of growth and succulency of stem and leaves.

Mr Murray has now no recollection of having had a grass under the name of *Poa nervosa*, and suspects that the name had been attached to my plant inadvertently by some of his young men.

The name does not appear in any botanical work that I have had access to, save in Sinclair's *Hortus Gramineus Woburnensis*, where it is twice cursorily mentioned, first at page 12, in illustrating the variety of grass stems, and at page 17, for that of the flower or seed. But whether the plant which I now take the freedom to bring under the Society's consideration is the same or not, I must leave to botanists of higher research to determine.

The importance of securing for bestial a full supply of green food, of rich and nutritious quality, during the summer and autumn months, is so evident to all who have observed the inconvenience and expense to which farmers in general are now almost yearly subjected, by the failure of their second crops of clover, that it requires little illustration. Many are induced to grow tares as a substitute, notwithstanding that they

* See Report by Mr Black of experiments on natural grasses at Dalkeith park, published in the Quarterly Journal of Agriculture, No. 40; also a description of its peculiarities in the Perthshire Courier of 21st April, 1836.

are considered a scourging crop, and little calculated to sustain the health and strength of working animals under any degree of hard labour.

The success of an experiment (to obviate the necessity of growing tares, and to meet the deficiency of after-grass), made by me last year on Mr Smythe's home farm, at Methven Castle, and again repeated this season, warrants me to make it more extensively known. This consists of a combination of grass seeds that will perfect their culms or flower-stems the same season in which they are sown, when not impeded by a grain crop, with two or three kinds of clovers, *suited*, as early or late food is required, and so varied by proportioning the several seeds, or sowing them at different times, as to serve *more* than all the purposes to which tares can be applied, without interfering with succeeding crops; or they may be made the basis of permanent pasture, by adding the seeds of the more enduring natural grasses. A short detail of the experiments and results, will best serve to illustrate the value and advantages of the system.

In spring 1837, a field of heavy red loam, which had been under a crop of potatoes and turnips the preceding season, was ready to be sown out with barley and grass seeds. From this about $2\frac{1}{2}$ imperial acres were set apart for the experiment, into which no grain was sown. Before the ground could be brought to a proper tilth, a tract of rainy weather set in which delayed the sowing until the 4th of May. When still in a damp state the ground was sown with 4 bushels of Italian rye-grass, *Lolium Italicum*; 8 lb. broad-leaved Timothy grass, *Phleum pratense*; $4\frac{1}{2}$ pecks of Fescue grasses, including $2\frac{1}{2}$ pecks of meadow fescue, *Festuca pratensis*; 20 lb. of crimson clover seed, *Trifolium incarnatum*; 8 lb. red clover, *Trifolium pratense*; and 12 lb. white clover, *Trifolium repens*, to secure permanent pasturage. All the seeds vegetated rather slowly, on account of the dry cold weather that followed, but on the return of moist weather, they grew with

astonishing rapidity, so as to be in condition for mowing as food for horses on the 15th of August, and they continued to yield an abundant supply until the end of October, part having been cut a second time. Many of the Italian rye-grass stalks measured five feet and upwards in length, from which a considerable quantity of ripe seeds were saved from a portion made into hay; the Timothy grass came partially into flower and seeded; and the crimson clover was much earlier than the common red, but both gave good returns. The horses that were fed on the mixture got into better condition than they had been during the previous part of the season, although their work was more severe, being employed at the time in subsoil ploughing moor-ground.

The weight of green produce cut in a dry state on the 26th of September, yielded at the rate of ten tons seven hundred-weight per imperial acre, and in hay two tons three hundred-weight. The greater part of the Italian rye-grass was killed during the winter by the long-continued snow storm, but that which remained, with the Timothy and meadow fescue grasses, gave an excellent crop of hay last summer, and was the first of the season to admit of being mown for the soiling of bestial.

The success of last year's experiment having encouraged a continuance of the system, about the same extent of ground as occupied with it last year, was this season set apart on another field, which had borne a crop of oats the preceding season. After having been broken up from old grass, and receiving a subsoil ploughing along with the rest of the field, the ground was manured with the same proportion of farm-yard dung as allotted to the remainder for green crops, and sown on the 20th of April with a similar assortment of grass seeds, as formerly enumerated, increasing the red clover to 7 lb. per acre, and lessening the crimson to the same weight, and adding to the Timothy 4 lb. per acre, with $\frac{1}{2}$ lb. of meadow foxtail grass, *Alopecurus pratensis*, besides to others of

the *poa* and *festuca* genera with white clover, to ensure a permanent sward to assimilate with the rest of the field when sown out after the green crop. The land was properly pulverized and smoothed with the roller, before the grass seeds were sown. These were covered in with a bush harrow (partially worn) and finished with a second rolling. The seeds sprung up vigorously, and have proved a valuable crop; the last of a first cutting having only been taken home on the 17th of October, until which time there had been an abundant supply of the best green food for the work horses, whilst many in the neighbourhood have been necessitated to keep theirs on hay for upwards of two months.

From the uniform springing of the variety of seeds sown, and the exposure of the field, the Italian rye-grass did not, this season, attain the size which it did in many parts of last year's crop, but still its *apparent* value was not reduced, though I had not the opportunity to ascertain the produce per acre by actual weight and measurement.

Several gentlemen around, and from a distance, have inspected these experiments, and seemed highly gratified with the results.

ON DISEASES IN THE SILVER FIR. *By Colonel MILLER,*
of Urquhart, Fifeshire.

[Silver Medal.]

The Silver Fir is the most beautiful, but at the same time the most delicate, of the Pine tribe usually cultivated in Britain. The well known affection of the larch, commonly called American blight, or plant lice, is injurious to every tree that it affects, but to the silver fir it is fatal. The appearance of the disease in both trees is pretty similar; but as every tree and every plant has its own particular species of in-

sect, its effects on both are different. The silver fir, for two or three years after it is planted, generally makes little progress in height, while it sends out strong and thick lateral branches. Under this canopy the insect establishes itself, from whence no storm can dislodge it. It spreads at first along the under side of the lower branches. It then quickly ascends the tree, and carries on its ravages with such rapidity, particularly when the weather is dry and warm, that, unless it be checked, the work of destruction will generally be completed in one season. It does not touch the leaves of the tree. The parts which it principally attacks are at the junction of the branches to the stem, towards the end of it. It there pierces through the bark, so as to permit the sap to exude; an enlargement takes place, and the leaves in the upper branches die first. So poisonous are its effects, that, after the disease is removed, nature shews little tendency to heal up the wounds, and the tree makes little progress for years afterwards.

The disease, I believe, originates from excessive thickness, or close planting, the most direful malady to which woods are subject, by a consequent stagnation and corruption of air. I have cured it by an application of lime-water, and have no doubt but that many other washes would answer the same purpose. But this could not be done upon a great scale, and, besides, the disease has generally made great progress before it is discovered.

What, then, is the cure, or rather preventive for this disease? I answer, *pruning*, free and early pruning. I am aware that the very mention of this word may startle many wood growers, who generally seem to be of opinion that pines ought not to be pruned. I can only say, that I have pruned them of all kinds for a number of years with the best effect. I was at one time a great enemy to pruning, but I have lived to see my error, and now candidly acknowledge it.

In June 1838 I had a number of silver firs attacked with the disease, the season the most unfavourable for pruning, as the trees were then making their shoots, when the leader is so tender, that the shaking of the tree in removing the branches is apt to break it. Even a small bird lighting upon it, and frequently the wind, will produce this effect. But there was no alternative. I accordingly set the saw to work, and the heavy rains which followed washed off the insects entirely, and the trees are now healthy.

It is a common observation in this country, that firs will prune themselves, and certainly they are generally left to do so, but it is by choking the lower branches for want of air. No one ever saw a single tree prune itself. They are pruned in northern countries, and the Swedes and Norwegians know very well that they could not send us sound timber otherwise; for a moment's reflection must satisfy any one, that a tree full of knots never can produce sound timber. Pruning ought to commence at a very early period, say five or six years old, and be continued every two or three years until the tree has attained its height; and, as a general rule, I should say that the height of the stem should be about equal to half the height of the tree. The branches should be removed close to the trunk, and as they will be small, the wound will be small also, and quickly healed up. No large branch ought ever to be removed, particularly if the tree is near maturity, for its constitution is similar to that of man himself. As he advances in life amputation becomes the more dangerous. This is particularly the case with respect to all the pine tribe, as bleeding will then take place to a great extent, but when they are young, it does no harm whatever.

Limes, and some other trees in pleasure-grounds for ornament, and in some cases for shelter, may be left without pruning; but to make timber, it is absolutely necessary to have recourse to it. It forces the sap into the trunk, which would

otherwise be elaborated in the lower branches. It permits the rains to penetrate the roots more freely ; allows a free circulation of air ; prevents trees from becoming mossed ; from being violently shaken by storms, or broken down by snow. When the branches of the Scots fir are torn off in this way, the bleeding is profuse.

When the leader is destroyed, most trees have a tendency to get several, and to spread out into a broad top. Great care is requisite to prevent this, and it ought to be done as soon as it takes place, for a tree of this kind never comes to height, and it occupies more than its legitimate share of the ground. Care must be taken at the same time not to over-prune, for there can be no doubt that trees, particularly in dry, warm weather, derive their nourishment principally from the atmosphere. The dews are then much heavier, and by being elaborated in the leaves are the beautiful means which nature employs to sustain the process of vegetation. Without this means, in tropical climes it would cease altogether. Whenever the trunk comes to send out numerous young shoots, it is a sure proof that the tree is overpruned. After pruning, all the branches cut off ought to be removed or burnt, as dead wood produces many insects that are injurious to trees.

Another subject intimately connected with pruning is the thickness of the trees together. Perhaps the best rule that can be given on this subject is, that they ought to have ample space to expand their branches without touching, for trees begin to repel each other before they come in contact. Trees, no doubt, grow the better from being planted thick at first ; but the labour and expense of thinning and clearing them afterwards are so great, that I believe few are aware of them but those who have experienced them. With respect to the best season for pruning, I believe that it may be done with safety *whenever the knife is sharp*, but the best months I should reckon to be October and November to

permit the winter storms to sweep off the insects from the trec, and to prevent its being broken down by snow.

One of the strongest reasons for thinning and pruning freely is, that woods may then be pastured to great advantage. In hill pasture the herbage will be doubled, and in many cases quadrupled, and come much earlier in spring.

In lands covered with heath, plant them with larch, at first thick; and when the heath is destroyed, thin out, and prune freely. Herbage will follow, and the value of the pasture be greatly increased. It is a general notion that sheep will not eat grass that grows among trees. But I do not find this to be the case. On the contrary, I find that they eat it very well, and run to it for shelter whenever a storm comes.

The bad effects of excessive thickness are well-known. Trees get diseased, stunted, and covered with moss. Their roots are smaller, and their bark thinner, than nature requires, which renders them unfit to resist the storm.

The silver fir likes a deep soft soil, and a sheltered situation. From its extreme tendency to lose its leader, I do not think it well suited for exposed grounds. Almost all trees grow well in soil of this nature, for the growth of timber seems to depend more upon the depth than the quality of the soil. Some of the finest trees in England are in the Vale of Mitcham, between Dorking and Guildford, where the soil in many parts is nothing more than a deep soft sand lying on chalk.

I enclose two specimens of the silver fir attacked by the disease. The one was killed by it, and the other recovered by the application of lime water, but has only grown a few inches in the space of two years.

ON THE DISEASE OF THE SILVER FIR. *By Mr JAMES BALDEN, Wood Forester to Lord Blantyre, at Lennoxlove, East Lothian.*

[Silver Medal.]

THE practical inquiry regarding the means to be adopted to check the ravages of the insects which have of late years so destructively infected the tribe of Silver Firs, and its congeners, seems to depend very materially on the question, "Do the insects produce the disease; or does a diseased state of the bark invite the insects, which then aggravate the morbid condition of the trees?" I shall attempt to decide this point.

After very minute observation, I have come to the conclusions after mentioned, arising from the following facts.

1. Long before a single insect is apparently visible on the tree, the cuticle of the bark is raised in a blister from the body of the bark, by the excretion of the peculiar resin of the tree, some of the blisters being fully a fourth of an inch in perpendicular depth, measured from without inwards, and they are covered with small white spots about the size of a pin-head, of a downy nature, resembling cotton. On examining these spots with a microscope, I have always found them to contain a number of small insects resembling mites in cheese, but apparently without feet, surrounded by a ring in which they move themselves round.

2. Shortly after the appearance of these blisters, the whole structure of the bark becomes dry, the circulation stops, or becomes extremely sluggish, and the bark itself becomes brittle, and contains very little resin.

3. These changes which appear on the structure of the bark are first noticed on the stems, and then proceed along the *under side* of the branches, and always *last of all*, along the upper side. Now, the relation between this course of the

morbific changes and the course of the circulation, is very evident ; and when it is farther observed, that the visible appearance of the insects takes place in directly the same course, and sometimes after the morbid alteration, it appears to me quite evident that the disease is the cause of the insects.— This is further corroborated by the next fact which I shall adduce, viz. :

4. The branches are often to be seen covered on the under side by the insects and their excretion, while the upper side is blistering and taking on the brittleness which I have mentioned, and thus preparing for the insects, which very soon thereafter most certainly are found at work upon it.

In May 1835, a number of fine silver firs, from fifteen to twenty feet in height, in the woods and pleasure grounds of which I have charge, were infected with the disease ; and being anxious, if possible, to save some of them, as they were conspicuously situated, I made the following experiments:—

1. I washed over some of them with a solution of lime.

2. I brushed some over with lime, about the thickness of paint ; and,

3. I washed some over with tobacco liquor and spirit of turpentine, in the proportion of about two wine-glassfuls of spirit of turpentine to a bottle of tobacco liquor.

All those applications had the desired effect of checking the progress of the disease ; but I have since observed, that those trees to which the lime was applied have all cracked in the bark, and do not look well ; those washed with the solution of lime look better ; but those washed with the tobacco liquor and turpentine recovered their original colour in the bark soon after having been washed, and have ever since looked beautiful and healthy, and have had no return of the disease, although many trees around them have been infected. This year, 1838, however, on a very minute examination of these trees, I discovered on some of them a very few spots, which, on being washed over, soon again became per-

fectly healthy: An experienced physician may check the progress of a most malignant malady, and may restore his patient to perfect health, but he cannot prevent the recurrence of the attack at a future period: in like manner, we may effectually cure this disease in trees, but cannot prevent its recurrence, particularly where other trees are infected around those which are cured. The tree should be washed over immediately on the appearance of the disease, because if taken in time it will be more easily done; whereas, if allowed to go a certain length, the tree must be two or three times washed; which would be a somewhat tedious operation, if a large plantation had to be gone over. If it should be wished to save a few fine trees in any plantation or pleasure ground, it may be easily done, and at a very trifling expense, as a man, or even an active boy, can wash over from ten to twelve trees of fifteen or twenty feet in height in a day, and the expense of the turpentine and liquor (supposing the disease to be taken in time), will only amount to about threepence a tree. If any infected trees, which may not be reckoned worth the trouble or expense of washing, should be standing near those already washed, they should be immediately cut down and burned. I have cut down diseased trees and burned them on the spot, and sound trees within eight or ten feet of them have not been touched with the disease, and I have been in the practice of doing this for a considerable time, and always with success. After a minute examination of this disease in the silver fir, I find it much the same as that which has affected the "Balm of Gilead" fir for a number of years past, and it is well known that but few of this latter remain in this part of the country, owing to no attempt having been made to check the disease. Had I thought on making the experiments related above sixteen or eighteen years sooner, I would have saved scores of trees which I have been obliged to cut down.

Such, then, is the result of the practical observations and experiments which I have made on the subject of this essay ; and I can only say, that out of the many cases in which I have used the turpentine and tobacco-liquor, I have never known the remedy to fail.

REPORT ON SUBSOIL AND TRENCH PLOUGHING. *By Mr ROBERT LAING jun., Campend, near Dalkeith.*

THERE is not, perhaps, in the present state of agriculture, a subject of such general importance to tracts of thin clay lands, as the application of subsoil and trench ploughing,—the beneficial effects on crops, after these have been *properly* applied, but especially the former, being almost incredible.

The soils to which these modes of ploughing are applicable, are, in my opinion, the same ; as in no one instance have I found trench-ploughing, where draining and subsoil-ploughing were not required, of the least advantage, excepting on deep *dry* loams ; on the contrary, when prosecuted on land where these two necessary accompaniments of all good farming had not preceded it, the consequences have been highly detrimental ;—in short, trench-ploughing requires to be used with the greatest care, as in most cases it will be beneficial only after the subsoil has been ameliorated by the admission of air and water into it by means of previous subsoil-ploughing.

I approve more of subsoil than trench ploughing ; not that the latter is unnecessary, but because the expense incurred by the previous indispensable operations of draining and subsoil-ploughing renders it almost impossible for the means of a tenant to undertake it when he is not assisted by his landlord, as is too often the case. I think it will generally be admitted, that subsoil is more essential than trench ploughing, because its corresponding effects are greater.

I am also of opinion, that subsoil-ploughing is an indispensable accompaniment to furrow-draining ; and, in my experience, I have found land to be more thoroughly dried after it (especially when there was any approach to clay in the subsoil), with a drain in every alternate furrow, than with a drain in every furrow without it ; in fact, in a stiff clay subsoil, I have seen drains of little service, the water for some time standing on the top of them till evaporated, while in the very next field which had been subsoil-ploughed, there was an immense flow of water from every drain, and not a drop to be seen on the surface.

I commenced subsoil-ploughing in the month of November 1836, a season, it will be remembered, remarkable for its early winter ; the ground having been covered with snow in October, and a succession of wet weather continuing during the whole season, rendered the circumstances under which I commenced most unfavourable. The field in which operations were commenced, consisting of ten Scotch acres, was at the time, and during the whole operation, so saturated with rain, that the horses' feet sunk in the unploughed ground from four to six inches, which shewed, that though there was a drain every alternate furrow, they had not yet drawn the water from the stiff retentive subsoil. This circumstance convinced me the more of the necessity of persevering in subsoil ploughing, which alone enabled me to accomplish my object, of thoroughly drying the soil, despite of the obstacle I had to overcome of the horses not working well together at first, increased by the wet state of the land, and not at all diminished by the unwillingness of the ploughmen to proceed in a work which they denounced as nonsensical, and as doing "naething but hashing their horses." But since these operations were finished, so apparent have the benefits been from them, that the same men now think they cannot do enough of that kind of work ; so that last winter, my head ploughman, in addi-

tion to fifteen acres gone over, wanted to plough another field, which I would have assented to, had it not been for the apprehension of rendering inefficient a great number of cross-drains that had been made several years ago under the old system of filling up with stones to the surface.

Notwithstanding the disadvantages consequent upon the wet state of the field, the results have been of the most flattering description. Since the work has been finished, little or no water has stood on the surface ; and in the spring of 1837, this field, which was usually the last workable on the farm, from its wetness, was the first ; and it had the advantage of the land working like loam, when compared with the solid soured furrow that was wont to be turned up. The field was drilled with beans, and the crop fully realized my expectations, and I think established the advantage of subsoil-ploughing ; for it produced 6 quarters per Scotch acre, which was, at least, one-fourth part of greater produce than it had ever before yielded ; and I am confident, that had it not been for the subsoil-ploughing, the crop must have been deficient ; because, from the wet state in which the land would have been ploughed, and probably souring all winter, the case would have been the same as with the adjoining field the previous season. In 1838, the same field produced a good crop of wheat after beans which all stood till cut down, and was equally strong in the furrow as on the crown of the ridge. Off 2 acres 2 roods 21 falls, were thrashed $15\frac{1}{2}$ quarters good, and $\frac{1}{2}$ quarter second wheat, being nearly at the rate of 6 quarters per Scotch acre. This is considered in any season a good crop, but more especially in the present season, when the prevailing opinion is that the average of wheat over Scotland will not exceed 3 quarters per Scotch acre.

November 1837 was more favourable to the prosecution of subsoil-ploughing than the winter of 1836, and an extent of 15 Scotch acres was subsoil-ploughed. About $\frac{1}{2}$ an acre of the field was ploughed in the usual way ; but so marked

was the difference in the bean-crop, that on the part that was not subsoil-ploughed, they were not only shorter, but not nearly so broad in the leaf, a pretty clear proof that they were not so luxuriant, and on every part of the field, in the furrows as well as on the intervening spaces, there was a very great crop. I have no hesitation in stating, that the produce will be eight quarters per acre, which is nearly double what is usually produced in any year, but particularly in this, when the bean-crop in this district and in East Lothian has proved almost a failure. The half acre not subsoil-ploughed, was not a bad crop; and I think it was benefited from the land above and below it having been subsoil-ploughed. Its breadth having only been about 50 feet, and lying, transversely to the declivity, that operation, I conceive, had acted as a drain to it both above and under its breadth. In 1838, ten acres were summer-fallowed and subsoil-ploughed; and I am so perfectly satisfied with the system, that I would recommend *all* land that has been furrow-drained, to be subsoil-ploughed in the succeeding season, the one operation, in my opinion, being quite inefficient without the other.

I have often been told by those who received no assistance from their landlords, that it was easy for me to drain and subsoil-plough. Certainly, great is the advantage of partaking of the liberality of my noble landlord, Lord Viscount Melville; but refusal from a landlord I hold to be no excuse for a tenant to neglect draining, because it will ultimately advantage himself; for example, it is the general practice of all good farmers, for six miles round Edinburgh, to give their land for green crops, 40 tons per Scotch acre of manure, which, at 5s per ton, costs L.10 per acre. Were land well drained, a better crop would be raised with 20 tons. Draining every 30 feet asunder, that is, 16 roods of 36 yards, at 5s per rood, costs L.4 per acre, which, with L.5, the price of 20 tons of manure, costs, in all, L.9 per acre, which is a saving of L.1, and at the

same time, the acquirement of a permanent improvement in the land. But although draining was to cost L.2 per acre additional, I am certain the benefits resulting from the small quantity of manure, when the land is made dry, would be greater than those from double the quantity of manure used on undrained land ; and it requires no argument to prove which of the two operations would be the more permanent in their effects.

It would, however, be much better for the land, and of course for both landlord and tenant, were a proper understanding on this subject established between them, as it is evident, when a tenant can give the full quantity of manure it will be a mutual advantage ; but when he is obliged to withhold part of that necessary ingredient for the purpose of expending the money in draining which would have been laid out in the purchase of manure, the landlord may depend upon it the draining will be performed in such a temporary manner, as only to be of service to the tenant while his lease endures ; but were he to assist the tenant in making the drains complete and permanent, the tenant would be the better able to purchase manure and incur the additional expense of subsoil-ploughing. It would be but fair, where a landlord assisted his tenant to the extent of two-thirds of the expense of draining, that an express understanding were made, that the land drained should be subsoil-ploughed the next season, or as soon after as circumstances permit. This arrangement would be of incalculable advantage to both landlord and tenant ; and were all landlords to co-operate with their tenants in this manner, their property would not only sooner be put into the highest state of cultivation, but a uniform progressive system of maintaining the land in fertility would be pursued by the tenants. Such ameliorating and amicable engagements should form the subject of covenants in every lease, until the whole land in the country were thoroughly drained and subsoil-ploughed.

I have now stated all the facts in my own experience of subsoil and trench-ploughing; and in confirmation of what I have stated, I may adduce the successful efforts of Mr Smith of Deanston, Mr Stirling of Glenbervie in Stirlingshire, and other gentlemen whose sentiments and experience are quite in unison with my own.*

It is unnecessary to enter into a lengthened detail of the efforts of Mr Smith in successfully establishing the mode of performing subsoil ploughing, as these are well known to agriculturists through the pages of his pamphlet, published by Messrs Drummond of Stirling. I shall, therefore, only advert to an improved plan of attaching the horses to the subsoil plough, the merit of which invention belongs to one of Mr Smith's ploughmen.

At this date, 15th February 1839, twenty acres are about finished subsoil ploughing under the new method of attaching the horses, which is so great a saving of labour, that three horses are found to do as much work as four did, previous to this new method being discovered.

This new plan is, that the horses are yoked two and two, with a master-tree or main bar of the same length, but of twice the strength, as that used with the common plough; two single or swing-trees or bars, equally strong, are attached to it in the common way, and at each end of *the two swing-trees* is fixed a pulley: chains twenty feet in length are attached to the haim-hooks of the rear horses, and come back through the pulleys of the draught bars, and thence to the leading horses; the leading horses require to be worked with the fore-ends of common cart traces to which they must be attached. About two feet

* I possess the names of gentlemen in Aberdeenshire, Ayrshire, Fifeshire, Kinross-shire, Lanarkshire, Perthshire, Stirlingshire, Cheshire, Cumberland county, Lancashire, Lincolnshire, and county of Northumberland, who have successfully practised subsoil-ploughing.

three inches from the collar of the rear horses a chain is required to keep the draught chains from their legs; pulleys fixed into two arms, eighteen inches long, answer better, as the chains by means of it, are also kept from their legs, and, while they work through the pulleys at the draught bars, also work through them. This mode of yoking the horses has not only the great advantage of the horses working easier, but also of equalizing the draught and making the plough more easily held.

In ploughing the twenty acres just mentioned, great advantages were derived from the muzzle or bridle of the common plough, invented by Mr Stirling, and before alluded to. One great advantage of this invention is, that the horses going on the unploughed land, two work as easily as three did before; another great advantage is, that the new subsoil ploughed furrow is not trampled on at all.

The bridle I have had in use is attached to a plough in the usual way; it measures from the extreme hole on each side nineteen inches, in which space are eleven holes; an inch and a half is required at each end (making the total length twenty-two inches), to which inch and a half is attached a chain two feet long, the other end of which is fixed to the beam of the plough immediately before the coulter: this is required to strengthen the bridle from the angle the horses draw at, so as to give the plough "less land."

Having now completed an extent of fifty five Scotch acres with the subsoil plough to the depth of from twelve to fifteen inches, the results are so satisfactory, that on none of the fields has a water-furrow been required to be drawn or cleared out. About four acres of a field noticed in a former part of this paper, as being summer fallowed in 1838, is so level on the surface, that before it was drained and subsoil ploughed, after being sown it required a man four days, at 1s. 6d. per diem, to clear out the cross water-furrows. It was so level

that after a fall of rain the ridge furrows stood brimful of water; that same portion of land is laying at this present moment without a single furrow or cross water course of any description, and so water can be seen on the surface. This has been the case since it was sown with wheat in October 1838.

Some opponents to subsoil ploughing advance as an argument, that it will require to be often repeated. This, the length of time since Mr Smith and others have first used the subsoil plough, is sufficient refutation; but supposing it required to be repeated every rotation of cropping, no improvement of so much importance can be made at so cheap a rate. As for example, in estimating the expense of this operation, the horses may be charged at 5s. each, to cover tear and wear, &c. which will amount to 20s. The furrow turned over being broad in proportion, four horses can accomplish a Scotch acre in ten hours, and when it is considered that one such ploughing will save a furrow in spring, there may be deducted the cost of one such 10s., leaving 10s. to be charged against subsoil ploughing. Others whose object is to prevent the introduction of subsoil ploughing, state with apparent plausibility, that it is not gaining ground, and that many who have tried it have now their ploughs laid aside never more to be used. There may be some who have done so from want of that patience and perseverance, which all improvements at first require; but the question may be put, Did those who have done so, previously drain their lands? If they did not, they acted wisely in not persisting. Others who have drained their land and found themselves equally unsuccessful, operated ignorantly, for in place of subsoil ploughing at right angles to the drains, which is the proper mode, they ploughed parallel to them, and so did harm instead of good, because the water was thereby sent in a direction opposite to that of the drains.

The opening of the subsoil in a tenacious clay on un-

drained land, makes one great pit for holding water over the whole field, which is a most destructive thing for cultivated plants. On this principle, experience has taught the agriculturist on tenacious clays to follow a system of shallow ploughing; but a single instance has not occurred to my observation of disappointment following subsoil-ploughing performed in a proper manner.

Mr Stirling is well known as an enterprising, persevering, and successful improver of land; and his estate shews the best results of thorough-draining and subsoil-ploughing. He is now quickly rooting out abundant crops of rushes, and substituting in their stead splendid crops of grain and luxuriant grass, on a soil, composed mostly of blue, tilly, tenacious clay, mixed with heavy stones, whose obstructions rendered his operations a very arduous undertaking; the result has been highly satisfactory, and perfectly conclusive of the benefits to be derived from these two expensive, but indispensable operations. The first field commenced with was drained every 18 feet, ploughed with the ordinary plough, and sown with oats, which were so bad, that they could scarcely be gathered together. It was afterwards subsoil-ploughed, and next season sown with turnip, which were a fair crop. In the following season, it was sown with barley and grass-seeds, and these were luxuriant crops. This year, 1838, it has produced an abundant crop of oats. Mr Stirling has gone over an extent of 50 acres with drains from 15 feet to 18 feet apart, all which have been subsoil-ploughed. He has also found it to be of great advantage to put a subsoil-plough, of small dimensions, through his turnip-crop immediately before finishing the cleaning of them.

Mr Stirling has also the merit of inventing a muzzle or bridle for the plough that goes immediately before the subsoil-plough, by which the horses are enabled to go on the unploughed land, and obviates the injury caused by their feet trampling the furrow that has just been subsoil-

ploughed. The small angle at which the horses have to draw, makes little difference in the draught, while the horse that worked in the furrow has now much firmer footing. The only difference between the bridle just noticed and the common one is, that it is 18 inches in length, and otherwise comparatively larger, and from its construction the plough is enabled to get "less land." This is the bridle I have described.

Mr Melvin, Ratho Mains, on his farm of Bonnington, Mid-Lothian, has applied the subsoil-plough extensively, and is so satisfied of the advantage arising from it, that he is prosecuting it with vigour. The results may be given in his own expressive words,—of the 18th October 1838.—“As requested by you, I subjoin a detailed account of the effects from the use of the subsoil-plough on various descriptions of land. Having a field consisting of five acres (imperial) of light dry land, well adapted for turnip husbandry, and three acres of the same description of soil, rendered very wet from the stiff stony clay which composed the subsoil, in pasture in 1835, and oats in 1836, and after having removed off the latter crop from the ground, the damp subsoil of the field was ploughed 14 inches deep with Murray of Polmaise' plough, drawn by three horses, yoked abreast; and the land being dry at the time, the trampling of the off-side horse was not injurious to the soil. The dry part of the field was ploughed fully a foot deep with the common plough; drawn with three horses abreast, which mixed an inch or two of sandy gravel with the soil. A crop of turnip was afterwards taken, followed with barley; and in both crops, the part that was subsoil-ploughed was deficient; indeed, no benefit had arisen from its use, whilst the part that was trench-ploughed, was decidedly increased in fertility.

“During the summer of 1837, a field of 22 acres, 18 of which consisted of a deep, soft, damp soil, lying on beds of sandy clay, variously mixed with gravel, was drained in the alternate furrows, with $2\frac{1}{2}$ feet deep drains, filled 14 inches

with stones, broken to pass through a three-inch ring ; and, upon levelling the ridges, there were fully 18 or 20 inches of soil over the stones. The rest of the field, being naturally drier, did not appear to stand so much in need of draining, and it was accordingly not drained. The whole field was subsoil-ploughed during July, two descriptions of ploughs being used ; the four-horse plough of Smith, and the three-horse plough of Murray. The greater size and weight of the four-horse plough proved most effective in raising out of the ground the land-fast stones ; but the three-horse plough went equally deep, and did as much work in the same time. The depth to which both reached was fully 16 inches, breaking up at least 6 inches of the subsoil : $\frac{3}{4}$ of an imperial acre a-day was the extent of the work executed ; and it cost about 12s. per acre, exclusive of the first furrow thrown out with the common plough. After sowing the land with wheat, the head-ridge furrows were cleared out as usual ; but since the subsoil-ploughing, I have not seen water run, or even stand, upon the drained part of the field. Some water lodged upon the undrained part at the breaking up of the snow storm, in March 1838, but was soon all absorbed ; a circumstance the more remarkable, as the water furrows, before both the operations, were very much hollowed out from the great currents of water that had run along them. A bulky crop of Talavera wheat has been secured from the field, all ready for the hook at the same time ; and not, as formerly, in patches, and some parts green, after the first portion was cut. The sown grasses are abundant and healthy, although retarded in growth, from the strength of the wheat crop. Much no doubt, of the improvement in the condition of this field is to be attributed to the draining ; still the quick absorption of the water in the furrows between the drains, (the land being cast), the decided improvement of the drier part, and the uniformly

equal crop, sufficiently attest the merits of subsoil-ploughing.

“A field of 12 acres consisting of stiff wet soil, lying upon a cold retentive clay, had been sown with drilled beans in 1836; and upon their separation from the ground, was drained in every 27 feet, with a tile-drain $2\frac{1}{2}$ feet deep, covered with gravel; and a small stone drain, 33 inches deep, alternately, and sown with oats in 1837. After harvest, the field appeared very little ameliorated with the drainage, the crop ripening very unequally. The whole was subsoil-ploughed to the depth of 16 inches. In the following November, a great many large stones turning up, and the subsoil being of a compact obdurate nature, each plough did not execute three quarters of an acre a-day. In April following, the condition of the land was materially altered, the rain having gradually found its way to the drains; and upon ploughing it, instead of a sour stiff furrow turning up, an open friable soil was exposed. So great, indeed, a change was effected, as to induce the planting of potatoes (no green crop having ever been seen on it before), the drills being drawn across the line of ridges, and the natural declivity of the ground. The crop fully equalled my expectations, and the colour of the soil is changed from a grey weather-beaten hue to a rich brown. In a few of the original deep furrows, the potatoes did not succeed, from not having been sufficiently filled up; it being imperatively necessary, after land is drained and subsoil-ploughed, to have it laid perfectly flat. I have subsoil-ploughed about 30 acres since November last year, but having been fallowed during the summer, I have not seen its effect upon the crop. But, in some portions left for a comparison, the subsoil-ploughed part has always been invariably drier, the whole land having been drained.

“I have never seen any benefit from the use of the subsoil-plough upon damp-bottomed land that had not been drained :
—The light dry land that was ploughed in one of the cases,

did not seem very much improved either ; and from the above experiments, I would be inclined only to subsoil-plough thorough-drained land having a close subsoil, as it is that only which will return a fair increase for the outlay to the tenant.

“For all stiff-bottomed land I prefer the four-horse, second-sized plough of Mr Smith ; and for lighter-bottomed land, I use the smaller three-horse plough. The work is very severe indeed, there being a greater amount of animal exertion required for one day’s work of the subsoil-plough than for two of the common-plough.”

Mr James Balfour, an intelligent and improving farmer on the estate of Lundin, Fife, gives his opinion of subsoil and trench ploughing, October 1828. “I think trench-ploughing requires to be done very cautiously, and only upon some descriptions of soils ; in fact, it is my opinion, that it should follow furrow-draining and subsoil-ploughing, when these have been done two or three years previous, on a soil that is a little too soft and resting on a strong subsoil, in order to allow the atmospherical air to ameliorate it, and then, the trench-plough should be used to mix it with the upper soil. I conceive the trench-plough a dangerous implement and injurious to a clay-soil resting on a clay-subsoil, on such land, the subsoil-plough is the implement that should be used.

“I do not think trench-ploughing of much advantage to dry land, if it is or has not been over cropped, although when there is a fine deep soil and a command of manure, I believe the trench-plough may be worked with advantage ; but even on this kind of soil, I would like to put the subsoil-plough through it some years before.”

There are few facts to prove that the effects of trench-ploughing are beneficial when applied without the previous operation of subsoil-ploughing, but had the benefits resulting from trench-ploughing been as obvious as that of subsoil-ploughing, there can be no doubt more would

have been produced. Mr Scott, Craiglockart, a respectable farmer near Edinburgh, trench-ploughed in the winter of 1833-4, with one common plough following the other, a field of 20 acres every two alternate ridges, and he has never observed on any of the crops the slightest difference.

Several years ago there was a sort of mania in East Lothian for trenching land with the spade, but experience soon taught the advocates of that system that draining was first necessary, from which operation more advantage has been reaped; but it is curious to observe, that although draining in that county has been carried to a great extent, yet among such an intelligent class of farmers, the invaluable discovery of subsoil-ploughing should be so little practised.

The use of the subsoil-plough has not been altogether confined to Britain; as a great many were last year sent to Ireland, from which country favourable accounts of subsoil-ploughing have been received; and as a proof of the steady increasing demand for that plough, the Messrs Drummond of Stirling, state to me that, from January 1st 1837, to 17th October 1838, they have sold 97 Smith's subsoil-ploughs; their record of the weight of all these, stands thus.

One-fourth of the whole number,			260 lb.
Do.	do.	-	300
Do.	do.	-	350
Do.	do.	-	400

One of their implement makers has made 131 Smith's subsoil-ploughs, since the implement came first into notice. They are in the practice of sending them to order, not only to most districts of Britain, but to Sweden, Prussia, European Turkey, the West Indies, and America, while the demand is steadily increasing.

REMARKS ON COTTAGE PREMIUMS, AND DESCRIPTION AND
SPECIFICATION OF COTTAGES BUILT ON THE ESTATE OF
THE EARL OF ROSEBURY.

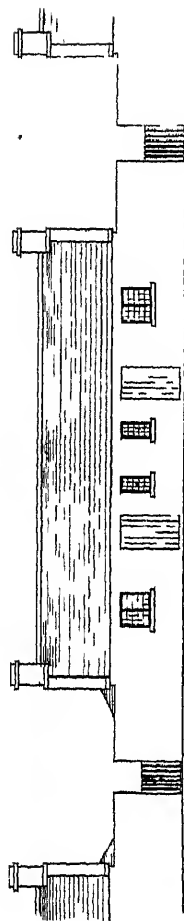
It has long been a subject of general regret, that while commerce, manufactures, and agriculture, with all the luxuries which belong to the higher stations of life, have of late years advanced in Scotland with a rapidity which has no parallel in any other part of Europe, the comforts of the peasantry have by no means improved in a corresponding degree. The habits which prevailed among the fathers almost invariably descend to the children, and are bequeathed by them to the generations which follow. It is never an easy matter to alter the character of a nation; yet there is so much good sense and good feeling among Scotchmen, that it is believed they have only to be convinced that the change desired is really an improvement, and the work will be done.

It must be no small gratification to those who think that the condition of the Scottish peasantry may be improved, to observe the ardour with which the Highland and Agricultural Society have entered upon this most important task, and the favourable prospects which are now before them; and as the complete success of their plans must depend upon their obtaining the aid of the influential classes among whom their Transactions circulate, it is believed their pages cannot be employed in a more profitable manner than in giving a detail of this part of their proceedings. There are scarcely any of their readers who have it not in their power to contribute more or less to the accomplishment of the object, and it is trusted that every individual will examine the plans for cottage improvement, brought forward by the Society, with the feeling that he has himself a part to perform.

According to the system which has now been adopted, premiums to the amount of L.4 are given annually for the

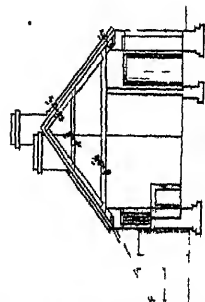
best kept cottages and cottage-gardens in each of four parishes of a county, and continued in the same county for four successive years. The fund from which these premiums are paid is not all advanced by the Society, but a guarantee is required from each parish to the extent of a half, as a proof of the interest which the gentlemen connected with it take in the matter. It is further explained to them, that they are expected to use their personal interest with the peasantry, to induce them to come forward as competitors. There is not the least difficulty in prevailing upon them to go on in a course of improvements once begun; but the first step will scarcely ever be taken unless at the urgent desire of some one whose good opinion they wish to possess. A very slight hint, however, from such a person, will in general be sufficient. These premiums were offered last year in four parishes in the county of Fife, and two in the county of Lanark, no guarantees having been received from any other parishes of that county. The result of the first year's trial has been given in a report of a committee, which has been extensively circulated. The Minister of one of the parishes declares, that such has been the improvement, that "no one can pass through the parish without being struck with the totally different aspect now presented by our gardens and cottages; and having occasion in the way of my duty to be frequently within the houses of the poor, I can safely say, that the external respect is nothing more than a faithful index of the neatness and comfort and taste to be found there." In another parish also, there has been a keen competition for the garden premium, and some competition also for that for the cottages. From the other four parishes there have been no reports, but it is stated in a letter, which will be noticed presently, that in one of them there had been "a great many competitors," and that there also the plan of the Society "is succeeding remarkably well." That it should not have had the same success universally this first year, can surprise no one. In Culter, where the change produced was so great, it may be observed, that all classes "cordially united in endeavouring to

PLAN
— of the —
FARM COTTAGES
— Erected upon —
THE EARL OF ROSKERRY'S
ESTATES.

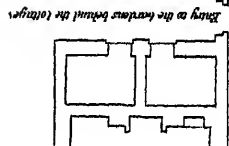


Note: At places where only one Cottage was built, the coal fire place, Ash pits and, if any were, sometimes placed behind the Cottage as shown by dotted lines in the Plan.

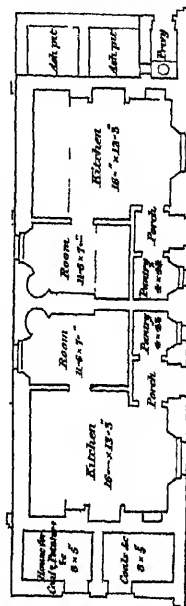
Elevation



Vertical Section.



Being to the westward of the cottages



Being to the eastward of the cottages

Ground Plan

Scale of 10 20 30 Feet

carry into effect the intentions of the Society, the proprietors and tenantry having willingly contributed to the funds, and in consequence, a larger sum was raised than was required" to make up the amount demanded by the rules of the Society. The other parishes may not have at once understood what was expected of them, but no fears are entertained that any oversight they may have made will remain uncorrected. The Minister of Culter gives it as his opinion, that scarcely a greater benefit could "be conferred on the other parishes of the bounds, than that the same stimulus should be applied to them;" and if so small an annual sum as L.4 thus expended can effect such changes, it cannot be doubted that the system will be speedily extended: in short, that if it shall be found to work in four parishes of any county of Scotland, as it has done in the parish of Culter, it will soon embrace the whole country. Although further pecuniary aid cannot be given by the Society, their cottage medals may be available for this purpose; and the experience of several gentlemen supports the assertion, that a very high value is set upon these testimonials by the persons on whom they are bestowed.

Two additional parishes of the county of Lanark have been induced, by the trial which has been made, to come forward with guarantees for the three remaining years of the period. Four parishes of Mid-Lothian, and four from Selkirkshire, have this year availed themselves of the offers of the Society. Next year the Society will take in the like number of parishes in East Lothian, Orkney, and Zetland; and the year following that, in two more counties. The system will then be in operation in eight counties, that is, in a fourth part of the whole counties of Scotland; and it will continue till it has gone over the entire kingdom. It will be observed that the reports of this year's competitions are to be lodged with the Society prior to the 1st of September, and it is trusted that their purport will be made known at the general show at Inverness. No toast is received at these meetings with more en-

thusiasm than "the Peasantry of Scotland," and it is to be presumed, a more gratifying communication could not be made, than that the plan of the Society for improving their domestic comforts, continues to give promise of success.

The cottage premiums of the Society naturally formed a prominent subject of discussion at the last General Meeting in January. Some remarks fell from the Noble Vice-President in the chair, the Earl of Rosebery, and were acquiesced in by the meeting, from which it erroneously was supposed by some, that his Lordship doubted the possibility of bringing about any improvement in the habits of the peasantry, till they should be provided with entirely new houses. This supposed opinion of his Lordship was heard with regret, by many of the well-wishers of the present plan, because of the deserved weight which any opinion of his must have with the country, particularly upon a subject, to which his Lordship was known to have paid so much attention.

An individual who was present at the meeting, but who has no connection at present with the management, offered some explanations in a letter under the signature "*Agricola*," in answer to his Lordship's reported observations; and as he has been pleased to express his approbation of the views contained in that letter, it is deemed proper to give a place to a portion of it here, which it is hoped will remove any doubts created by his observations at the meeting.

"Although improved accommodation," says *Agricola*, "will facilitate the cultivation of improved habits, I fear it would be going too far to say, that by putting a sloven into a good house, we shall at once effect the desired change upon his character. Too many know by experience, that in place of this, the house is apt to sink to a level with its occupant.

With the Noble Lord or the honourable gentleman who addressed the meeting, nothing of this kind can have occurred. Our peasantry are always desirous to recommend themselves to landlords so universally respected, and the personal interest which they would not fail to take in the working of their own benevolent plans, would

be quite sufficient to procure for them the warm co-operation of those for whose comfort they were intended. But I fear it must be assumed as a general rule, that accommodation, however perfect, will fail of its object, unless when seconded by the encouraging eye of a superior. Is it not then deserving of consideration, how far such encouragement may be productive of good, if afforded to the possessors of our present cottages, with all their discomforts and inconveniences? This is a very important inquiry. If nothing can be done till we have an entire set of new cottages, half a century may elapse before it may suit the convenience of many proprietors to incur such an expense. If, on the other hand, the peasantry can, even under their present unfavourable circumstances, be induced to throw off their slovenly habits, proprietors, in place of forcing upon them conveniences which they do not appreciate, would only have to supply what is absolutely necessary to enable them to carry into effect their own plans of improvement.—If we look carefully at the existing cottages in a considerable part of Scotland, it will be found that the walls are, in general, of sufficient strength, the roofs capable of being made perfectly water-tight, and the windows large enough to admit both air and light. I by no means say that they can be rendered as comfortable as new buildings, constructed from the first on the best principles; but, with very little labour, and scarcely any expense, they may be made to afford every essential comfort, and if so, surely we should endeavour to make the most of them till circumstances admit of our getting better. This is precisely what it appears to me the Directors are now doing. On looking at their conditions, it will be observed that they, in the first place, require the roof to be in good repair, the windows whole and clean, every nuisance removed from the door, and as much internal neatness as circumstances will admit of. These are not matters of competition, but requisites, without which no one is allowed to compete; and it cannot be doubted that the humblest cottage, which has received this attention, will afford much more comfort to the occupant than it can do, so long as those important particulars are neglected. The great object, then, is to secure a continuance of this attention; and what provision has been made for this? It is declared that the preference among competitors is to be decided by the degree of external ornament. Every cottage in the same climate must be as near as possible on a par in this respect, and it is therefore a perfectly fair subject of competition. Taste cultivated in any way never fails to extend, and if the nuisances which now deform the doors were removed, and those simple ornaments which nature herself suggests were fairly established in their place, not only

would the ground in front be protected from a return of these pollutions, but care would be taken that the walls, the windows, the roof, and the interior, should not disgrace what must be the object of admiration to every one who passes. These provisions appear to me perfectly calculated to effect their purpose. No Scotsman likes to be behind his neighbours, and if only a few individuals in a district could be prevailed upon to adopt these improvements, they would speedily spread over the whole population."

But although many of our cottages admit of being improved in the manner proposed, and it is trusted will be so improved, through the means adopted by the Society, unquestionably there are numbers every where so bad from the first, or become so ruinous through the effects of time, as to leave no choice but to pull them down and erect others in their stead. In such cases, it would be impossible for a proprietor of small means to take the assistance of an architect, and it has, in consequence, happened almost uniformly that the new building is little better than a copy of the old. A series of plans and specifications, for which a premium had been awarded by the Society to Mr George Smith, architect in Edinburgh, was published in 1834, and it was so well received, that not a single copy is now to be had in Edinburgh.

The Society is enabled, through the kindness of Lord Rosebery, now to publish the plans and specifications upon which many cottages have been erected by his Lordship, and which, having received the corrections suggested by his own experience, must be considered a still more certain guide. Following out still farther the views expressed by his Lordship at the General Meeting, it will be observed that the Society has, in the counties of Ayr and Perth, offered the Honorary Silver Medal—"1st, To the proprietor who shall have erected on his estate, during the year 1839, the best and most approved cottage:" And, "2d, To the proprietor who shall erect on his estate, during the years 1839-40-41, and 42, the greatest number of approved cottages," the Gold Medal.

The conditions on which these premiums are to be competed for, will be found fully explained in the list of premiums adhibited to the end of this Number. If they are ascertained to produce the desired effect in the counties of Ayr and Perth, it may reasonably be hoped to see cottages rising every where of a very superior description to those which we have at present, and thus by means of the publication of the Society's Transactions, landed proprietors shall be put in possession of ample directions upon this subject, by which every mason and carpenter in the country will become familiar with approved and tried plans of cottages.

The accompanying plan (Plate XI.) of the cottages on Lord Rosebery's estates will, by simple inspection, shew their construction better than any elaborate description; and as to the specifications on which they are built, and the cost of their erection, they will be best given in the terms transmitted to the Society.

“ The walls to be of the best rubble-work, founded with large flat stones, and all well packed and pointed with properly prepared lime mortar. The rebates, soles, and lintels for doors and windows, to be droved on the head and check, and broached on the breast. Corners to have broached stone, and both corners and rebates to be of a proper size and square-tailed; the skewes to be broached on the top, and droved on the edges, with a proper raglin for the tile; the chimney-tops to be of broached stone, with droved water berge, plinth, and cope; the jambs, lintels, and hearths of fire-places to be of droved stone, and the vents made 12" \times 13" inches, and plastered with haired lime. The partitions to be of stone and standard, the standards to be 4½" \times 2" inches, placed 2 feet apart upon a sill-plate, laid on a proper stone footing; all between standards to be filled in with small flat stones, bedded and jointed with lime, and to have warpings 4½" \times ¾" inch, every 2 feet in height, nailed to standards. The floors of porches and privies to be laid with scabbled stone-slugs; all the other floors to be laid with a composition of lime and engine-ashes, in proper proportions, well riddled, tempered, worked, laid 3 inches thick, smoothed, and well rubbed in; under the composition, 9 inches in depth of small broke stones to be laid, the earth being first excavated to admit of their being put in. The floors of ash-pits and soil-pit in privies to be kept

18 inches lower than floors of cottages, and an opening made in wall from soil to ash-pit.

" The safe lintels for doors and windows to be of 11" \times 3" inch red Petersburg plank, with 9 inches wall hold at each end, the whole space covered and saved by a hammer-dressed stone-arch where there is room. Wall-plates to be of single battens 7" \times 1 $\frac{1}{4}$ " inch. The rafters and balks of cottage-roofs to be of Memel, the size marked in the section, or of red Dram battens 6 $\frac{1}{2}$ " \times 2 $\frac{1}{4}$ " inches, placed 20 inches from centres, and the balks half-checked and nailed to rafters with double-garron nails, three in each joining. The roofs of coal-places and privy to be of the lean-to kind, rafters 4" \times 2" inches, checked to wall-plates at toes, and let 9 inches into wall at top. Tile lath to be 1 $\frac{1}{4}$ " \times 1 $\frac{5}{8}$ " each, cut out of red Petersburg batten. The windows to be made of Memel, in the sliding manner, sashes 2 $\frac{1}{8}$ inches thick, well glazed, primed, and bedded-in and drawn-up with lime; the windows of kitchen and room to have counter-check screws and plain deal shutters, barred and beaded on inside; the panty-window to be hinged and to fasten by an iron button, with ring, &c. The outside doors of cottages, places for coals and privy to be of plain deal, 1 $\frac{1}{8}$ inch thick, cut out of red Petersburg batten, three bars on the back, hung on crooks and bands; coal-place and cottage-doors to have stock-locks of 4s. 6d. value, and strong thumb-latches; privy-doors, a thumb-latch and iron bolt on inside. The inside doors to be also of plain deal, barred and beaded, hung with 13-inch T bands upon door-standards of red Dram batten 6" \times 2 $\frac{1}{2}$ " inches, and all to have plain beaded facings and keps, to have neat thumb-latches, and the press and pantry 2s. press-locks. All angles to have $\frac{3}{4}$ -inch beads, and ceilings of cottages lathed with best split lath. The pantries and presses to have three shelves each. A hatchway to be made in ceiling of porch, with hinged cover. The privy to have a properly-formed seat of 1 $\frac{1}{8}$ -inch timber. The inside doors, window-shutters, and other inside finishing may be of yellow American pine or white plank; all the other timbers to be of the best red wood, of Baltic growth. The roofs to be covered with grey or red tile, rendered with lime. The walls of cottages to get one coat plaster, the ceilings two coats and well finished.

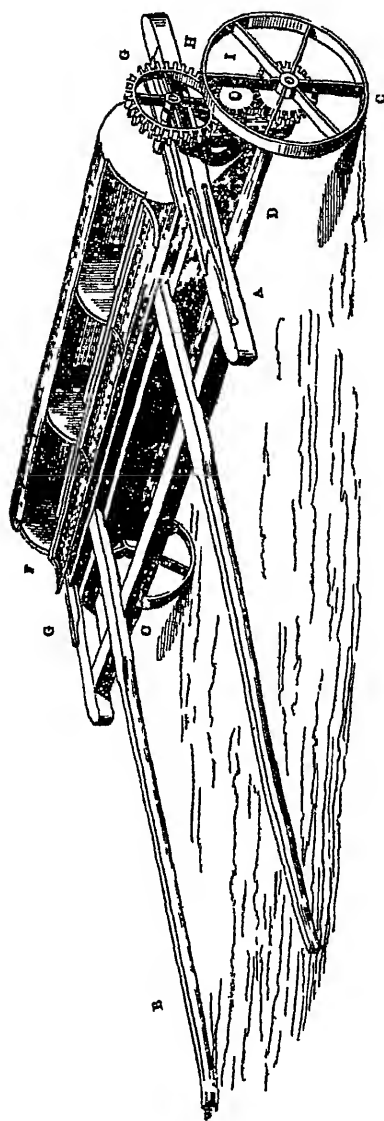
" The above cottages have generally cost from L.75 to L.85 a pair, exclusive of carriages."

DESCRIPTION OF A MACHINE FOR DISTRIBUTING SOOT, AND
REMARKS ON SOOT AS A TOP-DRESSING TO CROPS. *By*
Mr ALEXANDER MAIN, Factor to the Earl of Dalhousie.

THE importance of soot as a manure is becoming more and more apparent as farmers proceed in their experiments on the great scale with its application to various crops. The favourable results of soot-manure are producing an extension of its use ; an increase in the price of the article will follow the demand for it ; and the natural consequence of these results will be a desire to apply it with all possible economy. Mr Main, who has been for several years using the manure to a considerable extent, and with great success, has also turned his attention to the means of economizing its application, and, after repeated trials, has succeeded in the construction of a machine which, in a great measure, has realized his expectations, and of which a model has been submitted to the Society.

This soot-distributor is represented in perspective in the annexed cut, Fig. 1, while Fig. 2 is a transverse section, shewing more distinctly the relation of those parts that are but partially seen in Fig. 1. The section is taken on a plane passing through the middle of the machine, and at right angles to the two cylinders afterwards described, the horse-shafts being represented as broken off. The letters of reference apply to corresponding parts in both figures. The machine consists of a bed frame or body, A, to which are attached a pair of horse-shafts, B, and is mounted on a pair of low wheels, C, twenty-two inches in diameter, and four inches broad in the sole. These wheels are fixed upon, and turn with their axle, around which there is built a wooden cylinder, D, about eight inches in diameter, and six feet in length, fluted longitudinally. A chest, E, six feet in length, is appended to the body, and descends so as to

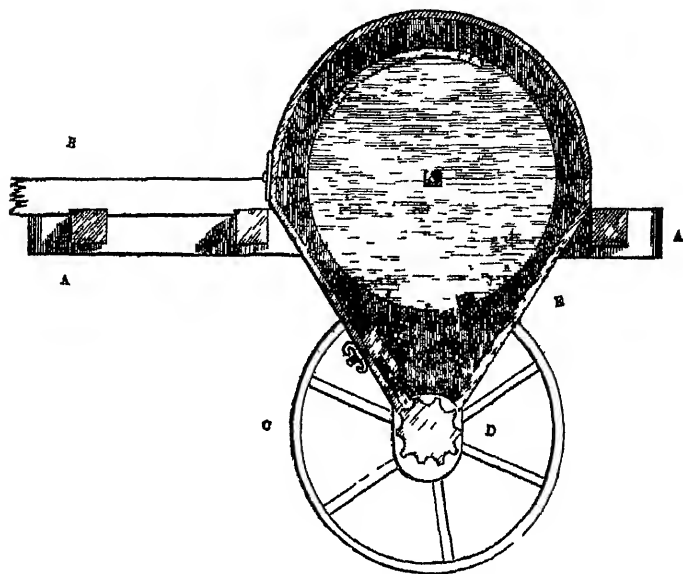
Fig. 1.



half embrace the cylinder, D, and is surmounted by a semi-cylindrical lid, hinged at one side to the edge of the chest.

(The lid is left out in Fig. 1, but is seen in section in Fig. 2.)

Fig. 2.



In the interior of the chest there is placed a cylinder of sheet-iron, F, about twenty-two inches in diameter, perforated all over, giving it the character of a riddle, the perforations being about one-half inch in diameter and as much apart. This cylinder is closed at both ends, and is divided into three compartments by divisions of thin deal, besides being furnished with a trap-door, opening longitudinally on hinges, as seen in Fig. 1, which can be secured by hook-and-eye fixtures. An axis of iron passes quite through the cylinder, having journals which rest in bearings in two jointed bars, G-G; and on one end of the axis, produced beyond the bar G, is mounted a wheel, H, of eighteen inches diameter. The axis of the carriage-wheels bears a toothed-wheel of nine inches diameter, which acts upon the wheel H through the intermediate

wheel I. The progressive motion of the machine, therefore, gives motion simultaneously to the two cylinders. The use of the fluted cylinder is for distributing the soot upon the ground, while that of the perforated one serves to separate stones, mortar, &c., that frequently are found mixed with the soot, and ready to retard and injure the effect of the fluted roller, while the curved lid of the chest prevents the soot flying off by the agitation of the cylinder.

The operations of the machine are effected in the following manner. The lid of the chest being thrown back, the door of the upper cylinder is opened, and a charge of soot introduced. The machine is then put in motion. The revolutions of the upper cylinder causes the soot to fall through it upon the fluted cylinder, which, in its revolutions, discharges in succession, the soot contained in the grooves or flutings. In order to regulate with more precision the quantity of soot discharged by the fluted cylinder, and to assist in keeping the cylinder clean, a brush, equal in length to the cylinder, is applied to and presses against the grooves, with more or less force, according to the quantity required to be discharged. When the soot has been discharged from the upper cylinder, the latter is lifted out of the chest by means of the jointed bars, GG, and while in this elevated position, it is supported by the elbow-joint rods, seen on the side of the bed-frame, Fig. 1; the trap-door being now opened, the cylinder is turned round till the opening comes downward, when the stones and mortar which have been separated from the soot are discharged; the cylinder is then returned to the chest, a fresh supply of soot is introduced, the cylinder closed, the lid of the chest brought down, and the work proceeds as before.

Though Mr Main has found this machine to fulfil the chief conditions of the distribution of soot, he is aware that it is imperfect in one respect—that of discharging, with to-

lerable precision, the smallest possible quantity per acre that may be held beneficial. The fluted cylinder and brush can hardly accomplish this. It has, therefore, been suggested to combine an arrangement on the principle of the broadcast sowing-machine, along with the perforated cylinder; and there appears no reason to doubt that such a combination, properly arranged, would effect the object. Indeed, a machine could be constructed on this principle that would not only answer the purpose of distributing soot, but rape-dust to any quantity per acre; and it might also serve as a broadcast machine for sowing grain.

Mr Main's experience of the effects of soot as a manure is thus given in his own words:—

“Previously to using soot, I was in the practice of applying saltpetre refuse, but this was an expensive stimulant, and, on recommendation, I made a trial of soot. I have now used it for three years, and every year has strengthened my conviction of its utility as a manure. In 1838, to make a fair trial, I manured eighteen ridges of grass, alternately, with soot and saltpetre, the saltpetre being applied at the rate of two cwt., and the soot forty bushels per Scots acre. The result was, that the ridges dressed with soot were more luxuriant than those with saltpetre. This experiment satisfied me as to *its effects*; and when to this was added the difference in *price*, the saltpetre at 10s. per cwt., costing 20s., the soot at 2d. per bushel, making it only 6s. 8d. per acre, it recommended itself at once as the more *useful* and *profitable* application. I have tried the same experiment on wheat, and with the same effect. I may add, that I have compared the effect of soot with that of other stimulants, and the result has been equally satisfactory in its favour. In 1838, I applied soot to a field of wheat which, at the time, seemed in so very precarious a state, as to make me even despair of its recovery. After applying the soot, however, it rallied; and, when cut down, there was not *a better crop on the farm*. I cannot ascribe this result to any other cause than the effects of the soot; and in this case it was only applied at the rate of twenty bushels per acre. Soot does not seem to injure grass in the estimation of *sheep*; and, in proof of this, I tried its effects on a small piece of pasture, upon which a few sheep were afterwards put to graze. The result was curious. There were many other ridges in the field besides those

dressed with soot, and all good grass, but the sheep continued to eat the sooted ridges until they were completely bared. With faces quite blackened, they fed heartily on the soot-dressed pasture.

“As to the precise quantity of soot necessary for a dressing, I cannot speak positively. I have found forty bushels to have a great effect, and, in one case mentioned, twenty bushels have succeeded. However, some of my neighbours do not scruple to apply sixty and even eighty bushels per acre. But I intend, this year, 1839, to make some experiments on *quantity*, and the result I shall communicate with much pleasure.

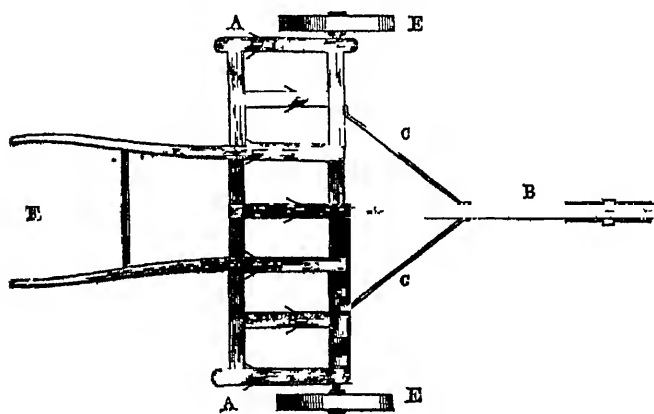
“From the short time that soot has been used in this quarter, its effects on *quality* have not yet been correctly ascertained, and some farmers object to its use on this account; my experience leads me to look upon this objection as groundless, for, as regards hay, that grown with soot is eaten with as much avidity as any other hay; and as for wheat, though the grain of soot-dressed wheat is certainly larger than the grain grown upon land without soot, still it remains to be proved that it is thereby injured or deteriorated in its mealing qualities. Perhaps, however, the *time* of applying the soot may have an effect on the *quality*. It is my opinion that the soot should be applied when the grass and wheat are young, about the end of April, or the first week of May, and not later. If applied later, the plants are then high, and do not admit of the soot falling freely to the ground. By an early application this evil is avoided. I may add, in conclusion, that I have always found *damp weather* the best in which to apply the soot, though, when the soot is used, it should be *quite dry*, otherwise the machine will not distribute it with regularity.”

DESCRIPTION OF A RIBBING MACHINE OR GRUBBER; AND
RECOMMENDATION OF A DRILL-HARROW AND ROLLER FOR
POTATO CULTURE. *By Mr JAMES ANDERSON, Money-*
more, Ireland.

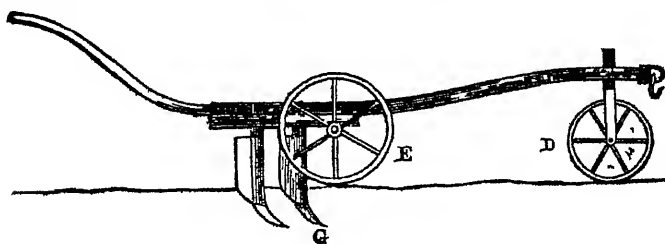
Mr Anderson details the necessity that induced him to adopt this form of ribbing machine, in the following words: “In the spring of 1832, I farmed Almondale, south approach, Park, the property of the Earl of Buchan. The park consists of about forty acres, the greater part of which was lying in the winter furrow after a

grain crop. The winter of 1831 had been wet, and the land, being naturally soft, had become so smooth, as to make it appear incapable of affording sufficient cover for the seed in the ordinary way by the harrow. Knowing, from experience, that spring ploughing is hurtful to such land, I resolved upon ribbing it. The usual method of ribbing land is with the small plough, and one horse; but having so great an extent of field to execute, I was led to the consideration of some mode of ribbing that should be more expeditious than with the small plough. I, in consequence, had a ribbing machine constructed, the model of which I now submit to the Highland and Agricultural Society of Scotland, which exceeded in efficiency my most sanguine expectations. When the field was sown, a single turn of the harrows was sufficient to cover the seed in the most complete manner."

The machine here alluded to by Mr Anderson was made of wood, somewhat of the form of some of the older grubbers, and is represented in the annexed cuts, Fig. 1. being a



geometrical plan, and Fig. 2. an elevation of the machine.



542 *Description of a Ribbing Machine or Grubber.*

It is almost unnecessary to say, that it might perhaps with greater utility be made of iron. The body of the machine, A, is six feet three inches wide, and two feet long over all; a slightly curved beam, B, projects forward, to which the draft is applied; the beam is supported laterally by the two iron stays, C, C, and vertically, to render the action more steady, by the wheel, D, attached by a spear passing through a mortice in the beam, by which it can be adjusted. A pair of wheels, E, E, turn upon axles bolted on the front bar of the body serving to regulate the depth of working; and a pair of handles or stilts, F, project backwards, by which the ploughman guides the implement. The tines or coulter, G, seven in number, are inserted one in each of the longitudinal bars of the body, A, A, where they are secured by means of a wedge. The coulter is simply chisel pointed, but they are each armed with a flanch of stout sheet-iron, shaped into the form of a double mould-board, and riveted to the coulter about four inches above its sole. As these little mould-boards are not required to turn over a sod, their form is not of that nice importance as in the case of the plough. The implement is drawn by a pair of horses.

The importance of the operation of ribbing is perhaps not appreciated to the extent which it deserves for some particular classes of soils, such as are of a soft friable texture, as also clayey soils when they have been long ploughed. It may therefore be not unimportant to suggest, that the common grubber can at any time be converted into an efficient ribbing machine, by changing its common tines for a set carrying each a pair of small mould-boards.

Mr Anderson in the same paper points out the advantages of a drill-harrow, and drill-roller for the culture of the potato. He recommends the harrow to be of a triangular shape. The fore tines, taking the top of the drill, should be very short, that the young shoots may be left undisturbed, and the

hind tines are about sixteen inches apart. The roller is of a length to extend over two drills, and is grooved transversely round to give it the shape of the drills. In cases where weather or other circumstances have prevented heavy land being so well pulverized as might be wished, previous to planting the potato, Mr Anderson has succeeded in giving fineness to the soil by first passing the roller over the drills, then the harrows, and, if necessary, by repeating the operations. Models of these implements have been deposited in the Society's Museum.

LIST OF MEMBERS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

AT 20TH FEBRUARY 1839.

ALPHABETICALLY ARRANGED, AND DISTINGUISHING THE YEAR OF
THEIR ADMISSION.

PRESIDENT,
HIS GRACE GEORGE GRANVILLE, DUKE OF SUTHERLAND.

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Those with § prefixed to their names are the only *original* constituent Members of the Society now surviving.

New Members are admitted at the General Meetings of the Society by Ballot.
There are two such meetings annually, viz. the Anniversary Meeting, on the second Tuesday of January, and the Summer General Meeting, on such day in June or July as may be fixed by the Directors, and intimated in terms of the Charter. Members pay an annual contribution of L.1 : 3 : 6 ; or in their option, and in full of all future claims, a Life Subscription of Twelve Guineas,

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LIST OF MEMBERS.

A		Admitted
¹	ARGYLL, His Grace George William, Duke of	1790
†	AILSA, The Most Noble Archibald, Marquis of, K. T.	1793
	ABERCORN, The Most Noble James, Marquis of,	1833
†	AIRLIE, The Right Hon. David, Earl of	1819
	ABERDEEN, The Right Hon. George, Earl of, K. T.	1805
	ABOYNE, The Right Hon. Charles, Earl of	1819
†	ARBUTHNOTT, The Right Hon. John, Viscount of	1803
†	ABERCROMBY, The Right Hon. George, Lord	1799
	ADAM, The Right Hon. William, Lord Chief-Commissioner	1816
10	ARBUTHNOTT, Lieut-General the Hon. Hugh, M. P. for Kincardineshire	1811
	ARBUTHNOTT, the Hon. John	1833
	ABERCROMBY, the Hon. George Ralph, younger of Tullibody, M. P. for Stirlingshire	1825
	ABERCROMBY, the Right Hon. James, Speaker of the House of Commons, and M. P. for the City of Edinburgh	1834
	AGNEW, Sir Andrew, of Lochnaw, Bart.	1829
	ABERCROMBY, Sir Robert, of Birkenbog and Forglen, Bart.	1816
	ANTHONY, Sir Edmund, of Rutherford, Bart.	1829
	ANSTRUTHER, Sir Ralph Abercrombie, of Balcaskie and Watten, Bart.	1832
	ADAM, Vice-Admiral Sir Charles, of Barns, M. P. for Kincross-shire, K. C. B.	1829
	ALEXANDER, Sir James Edward, late 16th Lancers	1831
20	ANGRAND, the Chevalier, Consul of France at Edinburgh	1839
	Adair, John, of Genoch	1829
	Adam, James, W. S.	1807
	Adam, James, Denovan Field, Stirlingshire,	1839
	Adam, John, residing at Turriff	1839
	Agnew, Colonel Vans, of Sheuchan	1829
	Ainslie, John, of Maxpofoe	1831
	Ainslie, P. B., residing at St Colme House	1826
	Aitchison, Francis, Merchant, Leith	1831

		Admitted
	Aitchison, James, Alderston	1822
30	Aitchison, William, younger of Drummore	1809
	Aitchison, William, at Menzion	1835
	Aitken, James, Gartcous	1834
	Aiton, Rev.*Dr John, Minister of Dalphington	1828
	Alcock, Robert, Advocate, Aberdeen	1833
	Alexander, Boyd, third son of the late Claud Alexander, of Ballymyle	1823
	Alexander, Claud, of Ballymyle	1810
	Alexander, W. Maxwell, of Southbar	1823
	Alison, Archibald, Advocate, Sheriff of Lanarkshire	1838
	Allan, Alexander, Advocate	1833
40	Allan, John, of Linkfield	1824
	Allan, William, of Glen and Hillside	1830
	Allardyce, Robert Barclay, of Ury	1810
	Allardes, James, of Boynsmill	1830
	Allen, James, Merchant, Grangemouth	1815
	Allen, Lieut.-Col. James, of Inchmartin	1821
	Allen, John Lee, of Erroll	1821
	Allen, John James, younger of Erroll, Captain R. N.	1839
	Alston, George, of Muirburn, Merchant, Glasgow	1838
	Alston, John, Manufacturer, Glasgow	1827
50	Alston, Robert Douglas, Merchant, Glasgow	1836
	Anderson, Adam, LL.D., St Andrews	1829
	Anderson, Adam, Advocate, Sheriff of Perthshire	1834
	Anderson, Alexander, Advocate, Aberdeen	1838
	Anderson, Major Alexander, of Kingask, H. E. I. C. S.	1833
	Anderson, David, of Moredun	1825
	Anderson, David, of St Germans	1829
	Anderson, George, Iron-foundry, Leith Walk	1827
	Anderson, James, Newton of Ballunie	1838
	Anderson, James A., Banker, Glasgow	1838
60	Anderson, John, of Fardenrush	1838
	Anderson, John, Merchant, Glasgow	1838
	Anderson, Michael, Regent Terrace, Edinburgh	1831
	Anderson, Thomas, of Craiganace, Advocate	1832
	Anderson, Dr William S., H. E. I. C. S., residing at Greenock	1839
	Anstruther, James, W. S.	1827
	Arbuthnot, James Carnegie, of Balnamoon	1813
	Arbuthnot, Thomas, of Meethall	1829
	Armstrong, Charles, of Cherry Valley, County of Antrim, Ireland	1836
	Arnott, G. A. Walker, of Arlary	1837
70	Arnott, James, of Leithfield, W. S.	1835

	Admitted
Arundell, G. Hunter, of Barjarg	1839
Aytoun, Roger, W. S.	1820
Aytoun, Roger, Banker, Greenock	1826
Aytoun, William Edmonstoun, W. S.	1838

B

	BEDFORD, His Grace John, Duke of, K. G., Hon. Mem.	1824
	BEDFORD, Her Grace Georgina, Duchess of	1834
	BUCKINGHAM and CHANDOS, His Grace Richard Plantagenet, Duke of, Honorary Member	1837
*	BUCCLEUGH and QUEENSBERRY, His Grace Walter Francis, Duke of, K. G.	1828
	BUCCLEUGH and QUEENSBERRY, Her Grace Charlotte, Duchess of	1835
80	† BUTE, The Most Noble John, Marquis of	1815
	† BREADALBANE, The Most Noble John, Marquis of	1819
	BREADALBANE, The Right Hon. Elizabeth, Marchioness of	1838
	BUCHAN, The Right Hon. Henry David, Earl of	1811
	BELHAVEN and STENTON, The Right Hon. Robert, Lord	1816
	BEXLEY, The Right Hon. Nicholas, Lord, Hon. Mem.	1801
	BENTINCK, General The Right Hon. Lord William, G. C. B., M. P.	1839
	BOYLE, Right Hon. David, Lord Justice-Clerk	1804
	BURNETT, Sir Thomas, of Leys, Bart.	1824
	BRUCE, Sir Michael, of Scotstown and Stenhouse, Bart.	1825
90	BLAIR, Sir David Hunter, of Brownhill, Bart.	1801
	BAIRD, Dame Ann Preston Campbell, Lady, of Fernton	1809
	BAIRD, Sir David, of Newbyth, Bart.	1838
	BAILLIE, Sir William, of Polkemmet, Bart.	1818
	BANNERMAN, Sir Alexander, of Elsick, Bart.	1835
	BOSWELL, Sir James, of Auchinleck, Bart.	1834
	BRISBANE, Lieutenant-General Sir Thomas M., of Brisbane and Makerstown, Bart. G. C. B.	1801
	BERESFORD, Admiral Sir John P., Bart. M. P., K. C. B.	1822
	BROWN, Sir Samuel, of Netherbyres, Capt. R. N.	1829
	BALLINGALL, Sir George, M. D., Prof. of Military Surgery in the University of Edinburgh	1821
100	Baikie, James, of Tankerness	1818
	Baillie, Charles, Advocate	1831
	Baillie, Ewen, of Dochfour	1824
	Baillie, George, of Jerviswood	1800
	Baillie, Robert Granberry, of Coulterallers	1819
	Bain, John, one of the Magistrates of Glasgow	1838
	Baird, Douglas, Gartsherrie	1838

		Admitted
	Baird, George, Gartsheirie	1838
	Baird, Rev. Dr George H., Principal of the University of Edinburgh, Chaplain of the Society	1793
	Baird, James, Gartsheirie	1838
110	Baird, John, of Shotts Lion-works	1815
	Baird, John, Highcross	1838
	Baird, Robert, Gartsheirie	1838
	Bald, Robert, Civil-Engineer, Edinburgh	1828
	Balfour, Francis, of Fernie	1824
	Balfour, James, of Pilrig, W.S.	1824
	Balfour, John, of Trenaby	1822
	Balfour, Captain William, of Elwick	1819
	Balfour, William, Merchant, Glasgow	1820
	Ballendene, James, of Pitgober	1834
120	Ballantyne, James, of Castlehill, Advocate	1822
	Ballantyne, James, of Holylee	1832
	Bannerman, Alexander, of Burnieboozle, M.P. for the City of Aberdeen	1835
	Bannerman, Charles, of Crimmonmogate	1828
	Bannerman, Patrick, Advocate, Aberdeen	1825
	Barclay, George Robertson, of Keavil	1834
	Barns, Major-General James Stevenson, of Kirkhill	1803
	Bartholomew, John, Merchant, Glasgow	1838
	Bartholomew, Robert, Merchant, Glasgow	1838
	Bartholomew, Thomas, Merchant, Glasgow	1838
130	Bartlemore, Alexander, of Seaside	1825
	Bauchope, Robert, Factor for his Grace the Duke of Ha- milton, at Kinneil	1831
	Bayley, Isaac, S.S.C.	1828
	Bayne, Dr James, Physician, Inverness	1813
	Beatson, H. Dundas, Captain, Swift Revenue Cutter	1809
	Beatson, Thomas, of Mawhill	1829
	Begbie, Alexander, of Pinnaclehill	1832
	Beith, John, Banker, Campbeltown	1826
	Beith, John, junior, Banker, Campbeltown	1836
	Belches, Alexander Hepburn Murray, of Invermay	1824
140	Belches, Lieut.-Colonel John H. Murray, Invermay	1825
	Belford, Andrew, of Glenfintaig, Solicitor, Inverness	1839
	Bell, Archibald, Advocate, Sheriff of Ayrshire	1833
	Bell, Carlyle, W.S., one of the Principal Clerks of the City of Edinburgh	1824
	Bell, George Graham, of Crurie, Advocate	1835
	Bell, Geo. Jos., Professor of the Law of Scotland, Uni- versity of Edinburgh	1802

		Admitted
	Bell, George, Merchant, Leith	1826
	Bell, Robert, Advocate, Procurator for the Church of Scotland	1823
	Bell, William, of Hunthill, W. S.	1813
	Berry, William, of Tayfield	1800
150	Bertram, William, of Cranshaws,	1826
	Berwick, Alexander, of Nortonhall	1839
	Beveridge, Thomas, Depute-Clerk of Session	1816
	Beveridge, Thomas Knox, W.S.	1833
	Binning, Alexander Monro, of Auchenbowie, W.S.	1833
	Binning, David Monro, of Softlaw, one of the Commissioners of the Customs, London	1799
	Binning, George Monro, younger of Softlaw, Advocate	1831
	Binny, John, of Forneth	1835
	Bishop, James, Restonhill	1839
	Black, James, Merchant, 17 Blythswood Square, Glasgow	1839
160	Black, James, Merchant, 12 Montague Place, Glasgow	1839
	Black, James, Merchant, Royal Bank Place, Glasgow	1838
	Black, James Spens, Merchant, 17 Blythswood Square, Glasgow	1839
	Blackburn, John, of Killearn	1827
	Blackwood, Alexander, Bookseller, Edinburgh	1835
	Blackwood, Alexander Thomas, of Ogcastle	1836
	Blackwood, Robert, Bookseller, Edinburgh	1835
	Blaikie, Francis, Tower Cottage, Melrose	1833
	Blaikie, John, of Craigiebuckler, Advocate, Aberdeen	1837
	Blair, David Anderson, of Inchyra	1819
170	Blair, James, of Penninghame, M. P.	1827
	Blair, Colonel Thomas Hunter, of Dunskey	1835
	Blair, William, of Blair	1821
	Blair, William, of Avonton	1817
	Blamire, William, of Thackwood, late M.P. for Cumberland	1833
	Blandow, Michel Von, St Petersburg, Honorary Member	1836
	Blane, Robert, of Grougar, 2d Life Guards	1836
	Blood, Bindon, of Cranaher, Clare, Ireland	1833
	Bonar, Andrew, Banker, Edinburgh	1824
	Bonar, James, of Kimmerghame	1835
180	Bonar, William, Banker, Edinburgh	1828
	Bontine, R. Cunningham, of Ardoch	1823
	Borthwick, George Augustus, M.D., Edinburgh	1817
	Borthwick, John, of Crookston	1812
	Borthwick, Thomas Chalmers, of Hopesrig	1838
	Boswall, Captain John Donaldson, of Wardie, R.N.	1814

	Admitted
Boswell, John, of Kingcaussie and Balmuto	1823
Boswell, John Douglas, of Garallan	1836
Boswell, William, Advocate, Sheriff of Berwickshire	1803
Bowie, John, W. S.	1815
190 Boyd, Edward, of Mertonhall	1813
Boyd, John, of Broadmeadows	1804
Boyle, Patrick, Advocate	1835
Brander, Lieut.-Colonel James, of Pitgaveny	1827
Brander, James, Banker, Golspie	1830
Brebner, James, Advocate, Aberdeen	1834
Bremner, Charles, W. S.	1800
Briggs, Lieut.-Col. John Falconer, of Strathairly	1828
Brock, Henry, Banker, Glasgow	1838
Brodie, Alexander, Barnie Mains	1822
200 Brodie, James Campbell, of Lethen	1831
Brodie, John, of Scoughall	1822
Brodie, Peter, of Clairlaw	1834
Brodie, William, of Brodie	1821
Brodie, William, Upper Keith	1822
Broom, Alexander, Architect and Builder, Glasgow	1838
Brotherston, James, Marionville, Isle of Man	1838
Brown, Alexander, Merchant, Aberdeen	1825
Brown, Alexander, Secretary Morayshire Farmer Club	1832
Brown, Alexander, Merchant, Glasgow	1838
210 Brown, Captain David, of Park	1834
Brown, Hugh, of Broadstone, Ayrshire	1823
Brown, Lieutenant J. D., Markle, East Lothian	1821
Brown, James, Accountant, Edinburgh	1816
Brown, Major James Dennistoun, late H.E. I. C. Service	1838
Brown, James Thomas, younger of Auchlochan	1837
Brown, John, of Coultermains	1807
Brown, Matthew, Port-Glasgow	1832
Brown, Peter, Linkwood, Elgin	1821
Brown, Robert, of Drumbrexbill	1802
220 Brown, Thomas, of Lanfine and Waterhaughs	1832
Brown, William, Merchant, Glasgow	1828
Brown, William, Banker, Maybole	1835
Brown, William Henry, of Ashley	1833
Browne, James, of Bindarroch, Merchant, Glasgow	1838
Bruce, Charles Lennox Cumming, of Roseile and Kinnaird	1817
Bruce, James, at Middleton, by Mintlaw	1837
Bruce, John, younger of Sumburgh	1829
Bruce, Oneziphorous Tyndall, of Falkland	1829
Bruce, Robert, of Symbister, Zetland	1807

		Admitted
230	Bruce, Robert, of Kennet	1819
	Bruce, Robert, Advocate, Sheriff of Argyllshire	1828
	Bruce, Thomas, of Arnot, late one of the Commissioners of Customs for Scotland	1820
	Bruce, Thomas, of Langlee, W.S.	1828
	Bruce, William, of Bigton, Zetland	1838
	Bryce, Rev. James, D.D., formerly Minister of the Scots Church, Calcutta	1813
	Buchan, George, of Kelloe	1826
	Buchanan, Alexander, of Arnprior	1819
	Buchanan, Andrew, of Auchintorlie	1838
	Buchanan, Andrew Carrick, of Mount Vernon	1827
240	Buchanan, Charles Snodgrass, of Cunninghamhead	1838
	Buchanan, George, of Arden	1838
	Buchanan, George, younger of Downahill, Merchant, Glas- gow	1838
	Buchanan, the Rev. George Craig, of Mackeanston	1814
	Buchanan, George, of Finnich Melise	1830
	Buchanan, James, late of Buenos Ayres, residing at Edin- burgh	1820
	Buchanan, James, younger of Catrine, Ayrshire	1838
	Buchanan, John, of Carbeth, by Balfron	1838
	Buchanan, John, Coachbuilder, Glasgow	1838
	Buchanan, John, junior, Merchant, Glasgow	1838
250	Buchanan, John, of Ardoch	1805
	Buchanan, John Cross, of Auchintoshan	1824
	Buchanan, John, Wine-Merchant, Glasgow	1827
	Buchanan, John, at Finnich	1831
	Buchanan, Peter, of Auchmar	1818
	Buchanan, Robert Carrick, of Drumpellier	1827
	Buchanan, Robert, Glasgow	1811
	Buchanan, Thomas, of Powis	1833
	Buchanan, William, Merchant, Glasgow	1828
	Burn, James, W.S.	1825
260	Burn, William, Architect, Edinburgh	1824
	Burnett, Alexander, at Crathes	1834
	Burnett, James Horn, W.S.	1834
	Burnett, John, of Kemnay	1809
	Burnett, Joseph, of Gadgirth	1836
	Burnett, Newell, Advocate, Aberdeen	1834
	Burnett, General William, of Banchory Lodge	1813
	Burnett, Thomas, Advocate, Aberdeen	1825
	Burnett, Captain William, R.N.	1834
	Burnley, W. F., Merchant, Glasgow	1838

		Admitted
270	Burt, Dr Robert, Physician, Edinburgh	1813
	Burt, John, Surgeon, Edinburgh	1831
	Butter, Archibald, of Faskally	1825

C

	CAMBRIDGE, His Royal Highness Prince Adolphus Frederick, Duke of, K. G.	1838
	CAITHNESS, The Right Hon. Alexander, Earl of	1814
†	CATHCART, General Right Hon. William, Earl of, K. T.	1807
†	CAWDOR, The Right Hon. John Frederick, Earl of	1831
	CAMPBELL, The Right Hon. Lord John	1798
	COREHOUSE, The Hon. Lord	1819
	CUNINGHAME, The Hon. Lord	1833
280	CATHCART, Colonel, The Hon. Frederick Macadam, of Craigengillan	1830
	CAMPBELL, Sir James, of Aberuchill and Kilbride, Bart.	1838
	CARMICHAEL, Sir Thomas Gibson, of Castlecraig, Bart.	1806
	CLERK, Sir George, of Penicuik, Bart. M. P.	1812
	COLQUHOUN, Sir James, of Luss, Bart.	1829
	CAMPBELL, Sir Archibald, of Succoth, Bart.	1813
	CAMPBELL, Sir John, of Ardnamurchan, Bart.	1829
	CAMPBELL, Sir Hugh Purves Hume, of Marchmont, Bart. M. P. for Berwickshire	1834
	CATHCART, Sir John Andrew, of Carleton, Bart.	1834
	CAMERON, Sir Duncan, of Fasfern, Bart.	1800
290	CAMPBELL, Lieut.-General Sir Archibald, of Garth, Bart. G. C. B.	1838
	CAMPBELL, Sir Duncan, of Barcaldine, Bart.	1802
	CAMPBELL, Sir Donald, of Dunstaffnage, Bart.	1823
	CAMPBELL, Lieut.-General Sir Colin, K. C. B.	1816
	COCHRANE, Captain Sir Thomas, Royal Navy, K. C. B.	1817
	CAMPBELL, Sir James, G. C. B.	1797
	CAMPBELL, Vice-Admiral Sir Patrick, K. C. B.	1819
	CAMPBELL, Sir John, Attorney-General, M. P. for the City of Edinburgh	1834
	CREWE, Sir George, Bart. of Calke Abbey, Derbyshire	1833
	Calderwood, Thomas Durham, of Polton	1822
300	Callander, William Burn, of Prestonhall	1818
	Callender, James Henry, of Craigforth	1830
	Cameron, Alexander, Surinam	1819
	Cameron, Allan, North Uist	1803
	Cameron, Donald, of Lochiel	1834
	Cameron, Donald Charles, of Foxhall	1825
	Cameron, Gordon, of Letterfindlay	1806

	Admitted
Cameron, Hugh Innes, Provost of Dingwall	1835
Cameron, John, Corrychoiley and Gleneaves	1826
Campbell, Lieutenant-Colonel Alexander, of Possil	1810
310 Campbell, Alexander, of Auchindarroch	1837
Campbell, Captain Alexander, of Brackley	1806
Campbell, Alexander, London	1804
Campbell, Alexander, of Edderline	1807
Campbell, Alexander, of Monzie	1833
Campbell, Alexander, of Bedlay	1833
Campbell, Alexander, of Barnhill	1833
Campbell, Alexander, Great Stuart Street, Edinburgh	1835
Campbell, Archibald, younger of Jura	1834
Campbell, Archibald, of Catrinebank	1810
320 Campbell, Archibald James, of Kilpatrick	1824
Campbell, Archibald, of Glendaruel	1826
Campbell, Archibald, Camusearnie Cottage, Factor on the estate of Menzies	1832
Campbell, Archibald, Lochhead	1838
Campbell, Arthur, of Condorrat, W. S.	1816
Campbell, Charles, of Combie	1808
Campbell, Charles, Banker, Glasgow	1838
Campbell, Colin, of Jura	1810
Campbell, Colin, of Camiseskan, Edinburgh	1829
Campbell, Colin, G., younger of Stonefield	1838
330 Campbell, David, Mount-Hamilton	1835
Campbell, Lieut.-Colonel Donald, of Knock	1806
Campbell, Lieut.-Colonel Dugald, Royal Artillery	1818
Campbell, Duncan, of Ross, Advocate	1823
Campbell, Farquhar, Ormsary	1839
Campbell, George, Son of Sir Archibald Campbell of Succoth, Bart.	1833
Campbell, George James, of Treesbanks	1835
Campbell, Henry Fletcher, of Boquhan	1823
Campbell, Humphrey Walter, Sheriff-substitute of Dunbartonshire	1838
Campbell, James Archibald, of Inverawe	1833
340 Campbell, James, of Craigie, Advocate	1824
Campbell, James, Merchant, and formerly one of the Magistrates of Glasgow	1838
Campbell, James, of Moore Park, Merchant, Glasgow	1838
Campbell, James, Succoth, Wine-Merchant, Edinburgh	1839
Campbell, John, late of Craignure	1803
Campbell, John, of Stonefield	1808
Campbell, John, of Glen Sadel	1817

	Admitted
Campbell, John, of Blairhall	1819
Campbell, John, of Southhall	1821
Campbell, John, younger of Otter	1827
350 Campbell, John, of Strachur	1829
Campbell, Colonel John, of Blackhall	1803
Campbell, John Deans, of Curreath and Loeg	1835
Campbell, John Archibald, W. S.	1813
Campbell, John, of Carbrook, W. S.	1793
Campbell, John, of Lincoln's Inn	1800
Campbell, Lorne, Chamberlain for the Duke of Argyll	1824
Campbell, Lachlan M'Neill, of Kintarbert	1833
Campbell, Mungo Nutter, of Ballymore	1832
Campbell, Mungo, of Hallyards	1824
360 Campbell, Mungo, of Hay Lodge	1837
Campbell, Ord Graham, Edinburgh	1838
Campbell, Richard of Auchinbreck	1833
Campbell, Richard D. Jura	1836
Campbell, Robert, Roseneath	1803
Campbell, Robert Nutter, of Kailzie	1798
Campbell, Robert, of Sonochan	1802
Campbell, Robert, younger of Auchmannoch	1816
Campbell, Rose, late of Spain	1809
Campbell, Thomas, Glasgow	1837
370 Campbell, Walter Frederick, of Islay, M.P. for Argyleshire	1817
Campbell, Walter, of Sunderland	1818
Campbell, Captain Walter, of Skipness	1836
Campbell, William, of Netherplace	1810
Campbell, William, W. S.	1805
Campbell, William, of Dunoon Castle	1838
Campbell, William, of Ormsary	1839
Campbell, William, Clerk of Supply for Argyleshire	1836
Campbell, William L., of Glenfalloch	1833
Canning, James, residing at Shields	1813
380 Carlisle, William, of Houstonfield	1835
Carmichael, James, Raploch Farm	1838
Carmichael, Maurice, of Eastend	1827
Carmichael, Michael, younger of Eastend	1825
Carnaby, Thomas, General Clerk of Lieutenancy, Forfar-shire	1831
Carnegie, John, of Redhall	1836
Carnegy, David, of Craigo	1827
Carnegy, William Fullarton Lindsay, of Boysack and Kinblethmont	1824
Carruthers, Alexander, of Warmanbie	1826

		Admitted
	Carruthers, William Thomas, of Dormont	1823
390	Carstairs, Drysdale, of Moreham Bank, Merchant, Leith	1838
	Cassels, David, Distiller at Arnprior	1824
	Cathcart, Elias, of Blairston, Advocate	1819
	Cathcart, James, Merchant, Leith	1805
	Chalmers, Charles, of Monkshill	1824
	Chalmers, David, of Westburn	1834
	Chalmers, Patrick, of Auldbar. M. P.	1834
	Chalmers, Lieutenant-Colonel W. of Glenelich	1822
	Chalmers, Lewis, Fraserburgh, Factor for Lord Saltoun	1833
	Chancellor, Alexander, of Shieldhill	1818
400	Charge, Thomas, of Barm	1833
	Cheape, Captain John, of Girgenti	1814
	Cheape, George, of Wellfield	1834
	Cheine, Patrick, Great King Street, Edinburgh	1820
	Cheyne, Captain Alexander, Royal Engineers	1825
	Cheyne, Henry, younger of Tangwick, W. S.	1838
	Cheyne, James Auchinleck, of Kilmarnock	1825
	Chicne, George Tod, Factor for Islay	1838
	Chisholm, Duncan, of Chisholm	1839
	Chisholm, Lachlan, younger of Lochans	1831
410	Chrisp, James, of Doddington, Wooler	1838
	Christie, James, Hillend, late Hon. E. I. Co.'s Service	1835
	Christie, Robert, Accountant, Edinburgh	1824
	Christie, William Macpherson, Ballimore	1837
	Christopher, Robert Adam Dundas, M. P.	1835
	Chrystie, Alexander, late Commander of the Hon. E. I. Co.'s Ship Thomas Coutts	1834
	Church, James, jun. Tower of Sark	1838
	Clapperton, Alexander, Merchant, Edinburgh	1838
	Clapperton, Thomas, of Spyelaw, Merchant, Edinburgh	1837
	Clark, Francis William, of Ulva	1838
420	Clark, James, of Boxtou	1834
	Clark, Robert, of Comrie	1810
	Clarke, Dr John, of Speddoch, M. D. K. H. Deputy Inspector General of Army Hospitals	1838
	Clason, Andrew, W. S.	1820
	Clason, The Rev. Dr Patrick, Edinburgh	1838
	Clayhills, Alexander, of Invergowrie	1838
	Cleghorn, George, of Weens	1821
	Cleland, James, LL.D., Glasgow	1827
	Cogan, Hugh, Merchant, Glasgow	1838
	Cogan, John, Merchant, Glasgow	1838
430	Cogan, Robert, Merchant, Glasgow	1838

	Admitted
Colebrooke, Thomas Edward, of Crawford	1838
Collier, Thomas, Hatton, Factor to the Right Hon. Lord Panmure	1835
Colquhoun, John Campbell, of Killermont, M. P.	1824
Colquhoun, John, Advocate, Sheriff of Dunbartonshire	1807
Colquhoun, William Lawrence, of Clathick	1838
Colt, John Hamilton, of Gartsherrie	1834
Connal, William, Merchant, Glasgow	1838
Connell, James, of Conheath	1828
Cooper, Samuel, of Ballindalloch	1818
440 Copland, David, Merchant, Aberdeen	1837
Copland, William, of Collieston	1836
Corrie, Thomas, of Culloch, Manager British Linen Co.	1826
Coulter, John, Tylefield, Glasgow	1833
Couper, Peter, W. S.	1811
Cowan, Alexander, Merchant, Edinburgh	1810
Cowan, Charles, Valleyfield	1836
Cowan, Duncan, Merchant, Edinburgh	8110
Craig, Alexander, Merchant, Edinburgh	1818
Craig, Alexander, Kirkton	1821
450 Craig, John, Merchant, Edinburgh	1818
Craig, William Gibson, younger of Riccarton, M.P. for the County of Edinburgh	1824
Craigie, Lieut.-Colonel John, Hon. E. I. Co.'s Service	1838
Craigie, Lawrence, of Glendoick	1824
Craigie, William Burnett, of Linton	1836
Cranfurd, James, younger of Ardmillan, Advocate	1835
Crawford, Charles, East Fortune	1822
Crawford, John Innes, of Bellfield	1816
Crawford, John, Sherpittlaw House, near Kelso	1826
Crawford, John, of Auchinames	1818
460 Crawford, William, of Doonside	1836
Crawford, William Macknight, of Cartsburn	1809
Crawford, William Howison, of Crawfordland	1809
Crawford, W. S. S. of Milton	1838
Crawford, John, late British Resident at Java	1819
Crichton, Adam, Factor to the Marquis of Bute, Dumfries House	1838
Crichton, Hew, Park Place, Edinburgh	1838
Crichton, Thomas, of Auchinskeoch, Advocate, Chamber- lain to the Duke of Buccleuch	1795
Crombie, Rev. Dr Alexander, of Phesdo	1834
Crombie, Alexander, younger of Phesdo	1836
470 Crombie, Lewis, Aberdeen	1834

	Admitted
Crooks, John, of Leven	1838
Crookshanks, Alexander, of Keithock	1836
Crow, James, at Kincaig	1826
Cruickshanks, James, of Langleypark	1829
Cumming, Alexander, of Grishernish	1837
Cunningham, Colonel John, of Newton	1829
Cunningham, John, of Duchrae	1830
Cunningham, John Sinclair, Banker, Edinburgh	1833
Cunningham, John Smith, of Caprington	1835
480 Cunningham, Thomas Smith, younger of Caprington	1835
Cunningham, William, of Lainshaw	1810
Cunningham, William, at Goodleyburn	1830
Cunningham, William, of Craigends	1828
Cunningham, William, of Enterkine	1836
Currie, Alexander, Advocate, Sheriff of Banffshire	1836
Currie, William, of Linthill	1832
Cuthbertson, Archibald, Peanston	1822
Cuthbertson, Donald, Accountant, Glasgow	1827
Cuthbertson, James, Seton Mains	1824
490 Cuthbertson, William, Glasgow	1836

D

DECAZES, The Duc, Peer of France, President of the Council of Agriculture, Honorary Member	1836
DOWNSHIRE, The Most Noble Arthur, Marquis of, K.P. Honorary Member	1837
DOUGLAS and CLYDESDALE, The Most Noble William Anthony Alexander, Marquis of	1834
† DALHOUSIE, The Right Hon. James, Earl of	1836
DUNMORE, The Right Hon. Alexander Edward, Earl of	1837
DALMENY, The Right Hon. Archibald, Lord, M. P.	1833
§ DUFFUS, The Right Hon. Benjamin, Lord	1784
DOUGLAS, The Right Hon. Archibald, Lord	1825
DOUGLAS, The Right Hon. Lord Wm. R. Keith, of Denino	1819
500 DUNDAS, The Right Hon. Wm., Lord Clerk-Register	1801
DUFF, Lieutenant-General the Hon. Sir Alexander	1814
DOUGLAS, Hon. Charles, of Douglas	1806
DUNBAR, The Hon. Robert, of Latheron Wheel	1832
DALYELL, Sir James, of Binns, Bart.	1798
DALRYMPLE, General Sir John Hamilton, of Cranstoun and Cousland, Bart.	1817
DUNBAR, Sir Archibald, of Northfield, Bart.	1794
DICK, Sir Robert Keith, of Prestonfield, Bart.	1816
DUNDAS, Sir David, of Dunira, Bart.	1828

		Admitted
	DRUMMOND, Sir F. Walker, of Hawthornden, Bart.	1823
510	DUNLOP, Sir John, of Dunlop, Bart. M.P. for Ayrshire,	1835
	DURHAM, Vice-Admiral Sir P. C. Henderson, of Fordel, G. C. B.	1823
	DALLAS, Major-General Sir Thomas, Kt.	1805
	D'ESTE, Colonel Sir Augustus Frederick	1822
	DICK, Major-General Sir R. H. of Tullimet, K. C. B.	1828
	DALYELL, Sir John Graham, Kt. Advocate	1807
	Dalgains, Andrew, at Ingliston	1833
	Dalgleish, A. Stephenson, Merchant, Glasgow	1838
	Dalgleish, Robert, Merchant, Glasgow	1838
	Dallas, James, late Merchant in Edinburgh	1819
520	Dalyell, John, of Lingo	1823
	Dalzell, James Allan, Madras Civil Service	1835
	Darling, Thomas, S. S. C.	1821
	Darroch, Lieutenant-General Duncan, of Gourrock	1830
	Daubeny, Robert Henry, of Bristol	1826
	Davidson, Duncan, of Tulloch	1824
	Davidson, Duncan, of Tillychety	1824
	Davidson, Hugh, of Cantray	1831
	Davidson, James, of Ruchill, Merchant, Glasgow	1838
	Davidson, James, Keeper of the Records of the Court of Session	1834
530	Davidson, James Gillespie, W. S.	1819
	Davidson, Lawrence, W. S.	1829
	Davidson, Patrick, younger of Tillychety	1834
	Davidson, Robert, Advocate	1819
	Davidson, William, Stanstill	1833
	Davidson, William, Writer, Glasgow	1838
	Deas, George, Advocate	1838
	De Lisle, Robert, of Acton Park, Yorkshire	1838
	Dempster, George, of Skibo	1823
	Dennistoun, James, of Dennistoun	1829
540	Dennistoun, James R., Merchant, Glasgow	1835
	Dennistoun, John, of Golfhill, M.P. for the City of Glasgow	1836
	Denny, Peter, Provost of Dunbarton	1838
	Dewar, Alexander Cumming, of Vogrie, 15th Regiment Bengal Native Infantry	1832
	Dewar, John, Advocate	1830
	Dick, John, Advocate	1827
	Dick, William, younger of Pitkarro	1828
	Dickson, Archibald, of Huntlaw	1823
	Dickson, George, late Merchant, Calcutta	1830
	Dickson, George, of Belchester	1831

	Admitted
550 Dickson, James Wardrobe, Advocate, Sheriff-Substitute, Falkirk	1834
Dickson, John, of Peclwalls	1838
Dingwall, John Duff, of Brucklay	1833
Dirom, Captain Alexander, of Mountannan	1835
Dirom, Lieut.-Colonel John, of Mountannan	1838
Dixon, John, of Daldowie, Merchant, Glasgow	1827
Dixon, William, of Govan, Merchant, Glasgow	1827
Dodd, William, Merchant, Glasgow	1837
Donaldson, James, of Thornwood	1839
Donaldson, John, of Auchairn, W. S.	1812
560 Donaldson, John, Advocate	1835
Douglas, Archibald, of Adderstone	1822
Douglas, Archibald, of Glenfinart	1836
Douglas, Francis Brown, Advocate	1839
Douglas, George, Advocate, Sheriff of Kincardineshire	1800
Douglas, James, of Cavers	1835
Douglas, Thomas D., Merchant, Glasgow	1838
Downie, Alexander, Merchant, Glasgow	1835
Downie, John, Merchant, Glasgow	1838
Downie, Robert, of Appin	1814
570 Dron, William, of Blackruthven	1829
Drummond, Vice-Admiral Adam, of Megginch	1822
Drummond, George Harley, late of Drumtochty	1810
Drummond, Henry Home, of Blair Drummond	1809
Drummond, George Home, younger of Blair Drummond	1835
Drummond, James, of Strageath	1836
Drummond, James Walker, younger of Hawthornden, 1st Grenadier Guards	1834
Drummond, John George, of Abbotsgrange and Millearn	1835
Drummond, Thomas, younger of Newton	1828
Drummond, William, Banker, Cupar Fife	1837
580 Dudgeon, Patrick, of Eastcraigs, W. S.	1827
Dudgeon, Robert, Merchant, Liverpool	1828
Dudgeon, William, Merchant, Leith	1826
Duff, Adam, Advocate, Sheriff of Edinburghshire	1813
Duff, Arthur, of Cocklaw	1832
Duff, The Rev. David, Minister of Kenmore	1839
Duff, Garden, of Hatton	1814
Duff, James Grant, of Eden	1828
Duff, Robert, of Fetteresso	1823
Duff, Richard Wharton, of Orton	1805
590 Duff, Thomas Abercromby, of Haddo	1835

	Admitted
Dunbar, Archibald, younger of Northfield	1839
Dunbar, Major P. Mountcoffer	1823
Duncan, Alexander, of Glendivine	1824
Duncan, George, Balchrystie, Fifeshire	1838
Duncan, James, at Cargill	1826
Duncan, James, Merchant, Leith	1826
Duncan, James J., of Garthamlock	1830
Dundas, Gabriel Hamilton, of Duddingston	1823
Dundas, Lieut. Colonel Thomas, of Carronhall	
600 Dunlop, Alexander, Advocate	1828
Dunlop, Archibald, Distiller, Haddington	1823
Dunlop, Campbell, Enterkine House	1832
Dunlop, Henry, of Craigton, Lord Provost of Glasgow	1838
Dunlop, James, of Annanhill	1824
Dunlop, James, of Macnairston, W. S.	1823
Dunlop, John, of Brockloch	1836
Dunlop, John Colin, Advocate, Sheriff of Renfrewshire	1824
Dunlop, William, Merchant, Edinburgh	1820
Dunn, William, of Kilbowie, Merchant, Glasgow	1827
610 Dunsmore, James, Secretary Herring Fishery Board	1817
Durham, General James, of Largo	1823
Dyson, Thomas C. of Willowfield, Halifax, Yorkshire	1832

E

ESTERHAZY, His Highness the Prince, Hungary, Honorary Member	1836
ERROL, The Right Hon. George William, K. T. Earl of	1837
EGLINTON, The Right Hon. Archibald, Earl of	1834
† ELGIN & KINCARDINE, The Right Hon. Thomas, Earl of, K. C.	1818
ELIBANK, The Right Hon. Alexander, Lord	1836
† ELCHO, The Right Hon. Francis, Lord	1819
EGERTON, The Right Hon. Lord Francis, M. P.	1822
620 ELPHINSTON, The Right Hon. John, Lord	1834
EMLYN, The Right Hon. John Frederick Viscount	1839
ELPHINSTON, The Hon. Mountstuart	1833
ELLIOT, Sir William of Stobbs, Bart.	1823
EDMONSTONE, Sir Archibald, of Duntreath, Bart.	1821
ERSKINE, Sir David, of Cambo, Bart.	1835
ELPHINSTON, Sir Robert Dalrymple Horn, of Logie-Elphinstone, Bart.	1813
Eccles, William, Merchant, Glasgow	1838
Eccles, William, Jun. Merchant, Glasgow	1838
Eddington, Thomas, Merchant, Glasgow	1813

	Admitted
630 Edmonstone, Archibald, Architect and Builder, Glasgow	1838
Edmonstone, Charles, of Ardross Park	1838
Edmonstone, James, of Newton	1798
Edmonstone, Thomas, of Bunes, Zetland	1838
Elder, John, Merchant, Slate	1815
Ellice, Edward, younger of Ardmellie, M. P.	1836
Elliot, George Scott, of Larriston	1813
Elliot, James, of Wolfie	1826
Elliot, Theodore F., of Braco	1824
Ellis, William, S. S. C.	1821
640 Elphinstone, Lieutenant-Colonel John	1827
Erskine, James, of Cambus	1808
Erskine, Col. William Howe Knight, of Pitodrie	1820
Evans, James, of Edmond Castle, near Bampton	1832
Ewart, Archibald, Depute Clerk of Chancery	1839
Ewing, James, of Levenside	1827
Ewing John Orr, residing at Croft, by Dumbarton	1838
Ewing, Robert, Merchant, Greenock	1830
Ewing, William Leckie, of Shingarton	1835

F

† FIFE, The Right Hon. James, Earl of, K. T.	1805
650 FORBES, The Right Hon. James Ochonehar, Lord	1831
FLEMING, Admiral the Hon. Charles Elphinstone, of Biggar and Cumbernald	1824
FORBES, The Hon. Walter, Master of Forbes	1838
FLAHAULT, Charles, Count Mercer De	1821
FORREST, The Right Hon. Sir James, of Comiston, Bart. Lord Provost of the City of Edinburgh	1805
FORBES, Sir John Stuart, of Pitsligo and Fettercairn, Bart. Treasurer of the Society	1830
FORBES, Sir John, of Craigievar, Bart.	1832
FERGUSON, Sir Charles Dalrymple, of Kilkerran, Bart.	1826
FORBES, Sir Charles, of Newe and Edinglassie, Bart.	1814
FOULIS, Sir James of Woodhall, Bart.	1816
660 FERGUSON, Sir Adam, Kt. Keeper of the Regalia	1799
FARQUHAR, Rear-Admiral Sir Arthur, R. N. C. B.	1826
Fairbairn, T., late of St Vincent's	1802
Fairlie, James, of Holmes	1827
Fairlie, James Ogilvie, of Williamfield	1836
Falconer, David, of Carlowrie	1807
Falconer, George, younger of Carlowrie	1837
Falconer, Cosmo, of Hartwoodhill	1805

		Admitted
	Farquhar, Lieut.-Colonel William, Madras Engineers, late British Resident at Singapore	1827
	Farquharson, Archibald, of Finzean	1815
670	Farquharson, James, of Invercauld	1831
	Farquharson, John, of Haughton	1808
	Farquharson, Peter, of Whitehouse	1833
	Farquharson, Thomas, of Baldovie	1836
	Fellenberg, Emanuel de, of Hofwyl, Switzerland, Hono- rary Member	1836
	Fergus, John, of Strathore	1832
	Ferguson, George, of Pitfour	1828
	Ferguson, James, of Kinmundy	1826
	Ferguson, John, late of Stronvar	1805
	Ferguson, John, of Knockindale	1824
680	Ferguson, Robert, of Raith, M. P.	1825
	Ferguson, Adam, of Woodhill	1807
	Fergusson, James, of Crosshill, Principal Clerk of Session	1800
	Fergusson, James, W. S.	1826
	Fergusson, Lieutenant-Colonel James, of Huntly Burn	1831
	Fergusson, John, Wine-Merchant, Leith	1826
	Fergusson, Samuel R., W. S.	1836
	Fernie, James Blyth, of Kilmux	1836
	Ferrie, John, Merchant, Greenock	1831
	Ferrie, Robert, of Blairtunnock	1827
690	Ferrier, Alexander, Bloomhill, near Dunbarton	1838
	Ferrier, Charles, of Badingsgill, Accountant, Edinburgh	1833
	Ferrier, John, W. S.	1796
	Findlay, Robert, of Easterhill, Banker in Glasgow	1838
	Finlay, Kirkman, of Castle Toward	1814
	Finlay, James, younger of Castle Toward	1826
	Finlay, William Warwick, younger of Trees	1826
	Finnie, John, Swanston Farm	1838
	Fisher, Daniel, S. S. C.	1819
	Fisher, James, M. D., late Staff Surgeon to the Army in Canada	1821
700	Fleming, John, of Claremont, Merchant, Glasgow	1838
	Fleming, Lieutenant-Colonel, of Inistore	1839
	Fleming, Robert, Tillichewen Castle, Dunbartonshire	1838
	Fleming, Robert, Minto Street, Edinburgh	1829
	Fleming, William Malcolm, of Barrochan, Vice-Lieute- nant of the County of Renfrew	1832
	Flemyng, Robert, Stewart, of Killiechaspie	1826
	Fletcher, Alexander, Merchant, Glasgow	1838

	Admitted
Fletcher, Angus, of Dunans, Advocate	1826
Fogo, David M., of Row	1809
Forbes, Charles, of Asloun, second son of Sir Charles Forbes, Bart.	1828
710 Forbes, Charles Henry, of Kingerloch	1836
Forbes, George, Banker, Edinburgh	1817
Forbes, George, of Auchnagathil, third son of Sir Charles Forbes, Bart.	1830
Forbes, George, of Springhill	1835
Forbes, James D., Professor of Natural Philosophy, University of Edinburgh	1836
Forbes, James Stewart, fourth son of Sir Charles Forbes, Bart.	1830
Forbes, John, younger of New and Edinglassie	1828
Forbes, Michie, of Crimond	1806
Forbes, Lieutenant-General Nathaniel, of Auchernach	1828
Forbes, Patrick, of St Catharine's	1834
720 Forbes, Peter, Wine-Merchant, Edinburgh	1838
Forbes, William, of Callander	1830
Forbes, William, younger of Medwyn, Advocate	1835
Fordyce, Thomas J., of Ayton	1828
Forman, John, W. S.	1809
Forman, John Nairne, W. S.	1831
Forsyth, James, of Dunach, Argyllshire	1838
Forsyth, John, Forbes	1826
Fouler, James, of Raddrey	1806
Foulds, William, of Skirnieland	1833
730 Fox, Richard M., of Foxhall, Rathowen, Ireland	1838
Fraser, Alexander, Merchant, Aberdeen	1817
Fraser, Captain Alexander, Royal Engineers	1818
Fraser, Major Andrew, of Flemington	1837
Fraser, Archibald Thomas Frederick, of Abertarff	1820
Fraser, Colonel Charles, of Inverallochy and Castle Fraser	1816
Fraser, Hugh, of Eskadale	1819
Fraser, Hugh, of Newton	1839
Fraser, James B., of Relig	1839
Fraser, John, Cashier, Cullen House	1812
740 Fraser, Robert, of Torbreck	1802
Fraser, Robert, residing at Brackla, Nairnshire	1839
Fraser, Symon, of Foyers	1800
Fraser, Capt. Thomas, of Balnain, R. N.	1839
Fraser, Captain William, residing at Brackla	1809
Fraser, William, of Glenmead, W. S.	1816

	Admitted
Fraser, William John, at Allerlie	1836
Fraser, Lieut.-Colonel William, of Balmakewan	1838
Fraser, William, of Hillside	1838
Fraser, William, jun., W.S.	1837
750 Freeland, Robert, of Gryffe Castle, Merchant, Glasgow	1835
Fullerton, Colonel S. M., of Fullarton	1825
Fullerton, John, of Demerara, Brisbane House	1825
Fullerton, Captain James, 30th Regiment	1824
Fullerton, John, of Kilmichael	1807
Furlong, William, of Erins, Argyllshire	1838
Fyfe, Andrew, M. D., Edinburgh	1823
Fyfe, James, of Smithfield	1806

G

GORDON, Her Grace Elizabeth, Duchess of	1834
† GALLOWAY, The Right Hon. Randolph, Earl of	1830
760 † § GLASGOW, The Right Hon. George, Earl of	1784
† GRAY, The Right Hon. Francis, Lord	1793
† GLENLYON, The Right Hon. George, Lord	1834
GREENOCK, Major-General the Right Hon. Charles, Lord, C. B., Commander of the Forces in Scotland	1809
GLENELG, The Right Hon. Charles, Lord	1816
GRAHAM, The Right Hon. Lord Montagu William	1831
GRAHAM, The Right Hon. Sir James Robert George, of Netherby, Bart. M. P.	1830
GORDON, Captain the Hon. William, R. N., M. P. for Aberdeenshire	1824
GRANT, Colonel the Hon. Francis William, of Grant, M. P. for Morayshire	1803
GRAY, The Hon. John, eldest son of Lord Gray	1821
770 GILLIES, The Hon. Lord	1809
GORDON, The Right Hon. Sir Robert, Balmoral, G. C. B.	1834
GORDON, Sir James, of Letterfourie, Bart.	1800
GORDON, Sir John, of Earlstoun, Bart.	1827
GORDON, Sir William Cumming, of Altyre and Gordon- ston, Bart.	1808
GIBSON, Sir Alexander C. Maitland, of Cliftonhall, Bart.	1818
GRANT, Sir George Macpherson, of Ballindalloch and In- vereshie, Bart.	1806
GRANT, Sir John Peter, of Rothiemurchus, Knight, Judge in the Supreme Court, Calcutta	1792
GORDON, Sir Charles, of Drimnin, Kt., Secretary of the Society	1835

		Admitted
	Galbraith, John, younger of Buckieburn	1838
780	Galbraith, Robert, of Greenhead, Merchant, Glasgow	1838
	Galbraith, William, of Blackhouse, Sheriff-Clerk of Str- lingshire	1822
	Galbreath, David Stewart, of Mackrihanish	1812
	Galloway, William, Accountant, Edinburgh	1814
	Garden, Alexander, Merchant, Glasgow	1827
	Gardiner, John, at Smithston	1830
	Gardyne, Thomas, of Middleton	1836
	Garioch, John, of Heathcote	1826
	Gartshore, John Murray, of Gartshore, Capt. 42d or Royal Highlanders	1825
	Geddes, Adam G., Airfield, Dalkeith	1819
790	Geekie, Alexander, of Baldowie	1837
	Geekie, Peter, Factor for the Earl of Mansfield at Scone	1837
	Gerard, John Mair, of Midstrath	1834
	Gibb, Elias, Merchant, Glasgow	1838
	Gibbon, Alexander, of Johnston	1834
	Gibbons, Edward, Factor to Macleod of Macleod	1830
	Gibson, Alexander, of Glencrosh	1825
	Gibson, Alexander Carmichael, younger of Castlecraig	1836
	Gibson, John, W. S.	1825
	Gibson, John, jun., W. S.	1828
800	Gilchrist, Dugald, of Ospisdale	1817
	Gillespie, Alexander, Surgeon, Edinburgh	1806
	Gillespie, Alexander, Merchant, Gould Square, London	1836
	Gillespie, George, of Biggar Park	1829
	Gillespie, James, Parkhall	1829
	Gillespie, Robert, Merchant, London	1829
	Gillespie, Thomas, of Ardochy	1821
	Gillespie, William, Gateside	1829
	Gillon, William Doune, of Wallhouse, M. P.	1823
	Gilmour, Walter James Little, of Craigmillar	1828
810	Gilmour, William, of Oatlands, Merchant, Glasgow	1838
	Gilzean, Thomas, of Bunachton	1813
	Girvan, Andrew, Accountant, Edinburgh	1831
	Gladstone, John, of Fasque	1833
	Gladstone, Thomas, younger of Fasque	1834
	Glasford, James, of Dougaldston, Advocate	1806
	Glasgow, R. Robertson, yr. of Mountgreenan, Advocate	1838
	Goalen, Alexander, Star Bank, near Newhaven	1805
	Goldie, Alexander, W. S.	1822
	Goldie, The Rev. Thomas S., Coldstream	1833

	Admitted
820 Goodwin, Lieutenant-Col. Hugh Maxwell, of Mount Alyn, Denbighshire	1830
Gordon, Captain Alexander, R. N.	1820
Gordon, Alexander, of Auchlunies	1808
Gordon, Alexander, George Square, Edinburgh	1817
Gordon, Alexander, Hillside Crescent	1834
Gordon, Charles, of Auchluchries	1832
Gordon, Captain Charles, R. N.	1835
Gordon, David, of Abergeldie	1822
Gordon, Francis, of Kincardine	1835
Gordon, George, at Huntly	1829
830 Gordon, James, of Culvenan	1798
Gordon, James, of Manar	1835
Gordon, James Farquhar, of Locharwoods, W. S.	1804
Gordon, James, of Revack	1813
Gordon, James, of Xeres de la Frontera	1834
Gordon, Colonel John, of Cluny	1807
Gordon, John, of Aikenhead	1838
Gordon, John David, of Wardhouse	1828
Gordon, John, of Cairnbulg, Advocate	1811
Gordon, John, of Corstoun	1829
840 Gordon, John, of Newton	1834
Gordon, John Taylor, of Nethermuir	1831
Gordon, Joseph, W. S.	1804
Gordon, Michael, younger of Abergeldie	1831
Gordon, Peter Charles, younger of Wardhouse	1834
Gordon, Peter Laing, of Craigmile	1834
Gordon, Robert, of Jamaica	1802
Gordon, Robert, Great King Street, Edinburgh	1833
Gordon, Thomas, of Buthlaw	1818
Gordon, Lieutenant-Colonel Thomas, of Park	1825
850 Gordon, William, of Fyvie	1834
Gordon, Lieutenant-Col. W. A., late 50th Regiment, C.B.	1818
Gordon, Capt. William, H. E. I. C. Service, residing at Newton	1828
Gordon, William, of Aberdour	1834
Govan, John, W. S.	1809
Gracie, John Black, W. S.	1834
Græme, Major George Drummond, younger of Inch- braikie	1839
Græme, Robert, of Garvock	1824
Graham, Major David, of Meiklewood	1831
Graham, Frederick, Factor to the Duke of Athole	1821

	Admitted
860 Graham, George, late of Cassafuar	1817
Graham, George, of Shaw	1826
Graham, Henry, Surgeon, Shandwick Place, Edinburgh	1839
Graham, Humphrey, W. S.	1819
Graham, James, of Leitchtown	1827
Graham, James Gillespie, of Orchill	1806
Graham, John, younger of Ballagan	1823
Graham, John, at Newbigging	1829
Graham, Patrick, of Limekilns	1836
Graham, Robert, of Redgorton, Advocate	1817
870 Graham, Robert, M. D. Professor of Botany in the University of Edinburgh	1821
Graham, Robert, Merchant, Leith	1826
Graham, William, of Greigston	1835
Graham, William Stirling, of Airth	1833
Graham, William, Writer, Glasgow	1828
Graham, Lieut.-Colonel William, of Mossknow	1834
Graham, William C. Cuninghame, of Gartmore	1796
Grainger, John, Factor to the Marquis of Lothian, at Mounteviot	1836
Grant, Alexander, of Aberlour	1810
Grant, Alexander, of Carnousie	1835
880 Grant, Captain Charles, Barrackmaster, Glasgow	1816
Grant, David Macdowall, of Arndilly	
Grant, Dougal, York Place, Edinburgh	1833
Grant, Duncan, younger of Bught, W. S.	1825
Grant, Francis William, younger of Grant, M. P.	1837
Grant, Frederick, of Mount Cyrus	1832
Grant, James M., of Glenmoriston and Moy	1810
Grant, James, of Bught	1813
Grant, Rev. James, First Minister of South Leith	1828
Grant, John Peter, W. S.	1823
890 Grant, John, of Kilgraston	1819
Grant, John Macpherson, younger of Ballindalloch and Invereshie	1827
Grant, Patrick, W. S., Sheriff-Clerk of Inverness-shire	1836
Grant, Robert, of Kincorth	1826
Grant, Robert, of Tilliefour	1830
Grant, William, younger of Elchies	1833
Grant, W. P., younger of Rothiemurchus	1821
Grassick, Charles, residing at Buchaam	1880
Grassick, John, Mains of Glenbucket	1829

		Admitted
	Gray, Alexander, Accountant and Actuary, Glasgow	1838
900	Gray, Andrew Farquhar, of Glentig, Comptroller of the Customs, Aberdeen	1835
	Gray, Charles, Distiller, Glasgow	1838
	Gray, John, Merchant, Greenock	1831
	Gray, Roderick, Factor at Peterhead for the Merchant Hospital of Edinburgh	1829
	Gray, Stephen, of Mansfield	1838
	Gray, William, of Blairbeth, Goldsmith, Glasgow	1838
	Gray, William, late of Gibraltar, Merchant, Glasgow	1838
	Greenshields, John, of Kerse	1829
	Gregorson, John, of Ardtornish, Sheriff-Substitute, Mull	1805
	Gregory, Arthur Thomas, of Buchromb	1833
910	Greig, James, of Eccles, W. S.	1809
	Greig, James, at Tullich	1821
	Greig, John, of Lethangie	1833
	Grierson, William, of Garroch, W. S.	1828
	Grieve, Andrew, W. S.	1838
	Grieve, William, of Branzholm Park	1834
	Gulland, William Erskine, of Stripeside	1833
	Gunn, George, Factor on the Estate of Sutherland	1821
	Guthrie, George, Factor to the Earl of Stair, Wigtonshire	1839
	Guthrie, John, of Guthrie	1836
920	Guthrie, John, younger of Guthrie	1836
	Guthrie, Major, Perth	1826
	Gwynne, Alban Thomas Jones, of Monachty, Cardigan-shire	1834

H

* HAMILTON & BRANDON, His Grace Alexander, Duke of, K. G.		1804
	HASTINGS, The Most Noble the Marquis of	1830
	HASTINGS, The Right Hon. Flora, Marchioness of	1805
†	HUNTLY, The Most Noble George, Marquis of, K. T.	1793
	HOME, The Right Hon. Alexander, Earl of	1832
†	HADDINGTON, The Right Hon. Thomas, Earl of	1804
	HOPKOTON, The Right Hon. John, Earl of	1826
930	HAY, The Right Hon. Lord John, Capt. R. N.	1824
	HALLYBURTON, The Right Hon. Lord Douglas Gordon, of Pitcur, M. P. for Forfarshire	1803
	HEPBURN, Sir Thomas Buchan, of Smeaton Hepburn, Bart. M. P.	1837
	HERRIES, The Right Hon. J. C., M. P.	1829

		Admitted
	HOPE, The Right Hon. Charles, Lord President of the Court of Session, and Lord Justice-General of Scotland	1798
	HOPE, Sir John, of Craighall, Bart.	1808
	HAY, Sir John, of Park, Bart. Advocate, Sheriff-Substitute of Stirlingshire	1834
	HAY, Sir Adam, of Smithfield and Hayston, Bart.	1825
	HALL, Sir John, of Dunglass, Bart.	1829
	HAY, Sir James Dalrymple, of Park Place, Bart.	1816
940	HONYMAN, Sir Richard B. Johnston, of Armadale, Bart.	1817
	HALLIDAY, Sir Andrew, M.D.	1806
	HUSSEY, Vice-Admiral Sir R. H., K. C. B., of Wood-Walton, Huntingdonshire	1827
	HAY, Colonel Sir A. Leith, of Bannes	1819
	HOOKE, Sir William Jackson, F. R. S., K. H., Professor of Botany, University of Glasgow	1839
	Hagart, Thomas, of Bantaskine	1826
	Haig, Alexander, of Blairhill	1833
	Halket, Charles Craigie, of Hallhill	1834
	Hall, James, of Killeen, Argyllshire	1839
	Hamilton, Archibald, of Carcluie, Rozelle, Capt. H.E.I.C.S.	1833
950	Hamilton, Dr James, of Kildonan, Professor of Midwifery, University of Edinburgh	1817
	Hamilton, James, of Kames, W. S.	1807
	Hamilton, James, of Barns	1828
	Hamilton, John, of Sundrum	1839
	Hamilton, John Ferrier, of Westport	1827
	Hamilton, John, of Fairholm	1827
	Hamilton, Montgomery, Captain H. E. I. C., Naval Service	1836
	Hamilton, Lieut.-Colonel R. Campbell, of Milburn and Dalsenf	1804
	Hamilton, Robert William, Leith	1814
	Hamilton, Thomas, Architect, Edinburgh	1826
960	Hamilton, William, Merchant, Glasgow	1823
	Hamilton, William, of Craighlaw	1829
	Harden, Robert Allan, 6 Doune Terrace, Edinburgh	1838
	Hart, Major Thomas, of Castlemilk	1805
	Harvey, Archibald, of Killellan, Merchant, Glasgow	1838
	Harvey, Arthur, of Tillygreig	1838
	Harvey, Lieut.-Col. James Lee, of Castlesemple	1823
	Harvey, John Rae Lee, younger of Castlesemple	1836
	Harvey, John, of Ichwell, Bury, and Tiningly Park, Yorkshire	1809

	Admitted
Harvey, William, Distiller, Yoker	1838
970 Harvie, Robert, Distiller, Port-Dundas	1838
Hastie, Archibald, M. P. for Paisley	1838
Hastie, John, Merchant, Calcutta, now in Edinburgh	1838
Hathorn, Hugh, of Castlewigg	1825
Hathorn, Vans, of Garthland, W. S.	1802
Hawkins, James Whitshed, of Dunnichen	1819
Hay, Alexander, of Hardengreen	1837
Hay, Charles, of Ballindoch	1825
Hay, James, of Belton, Capt. R. N.	1820
Hay, James, Merchant, Leith	1828
980 Hay, John, of Letham	1834
Hay, John Stewart, of Coylsfield	1836
Hay, Robert, of Lawfield	1807
Hay, William, of Laxfrith	1828
Hay, William, of Dunse Castle	1819
Hay, William, of Hopes	1835
Heathcot, John, M. P. for Tiverton, Honorary Member	1837
Hector, Alexander, Writer, Edinburgh	1824
Henderson, Alexander, Long Niddry	1837
Henderson, Captain David, younger of Stemster	1829
990 Henderson, Duncan, M. D., 78th Regt.	1825
Henderson, John, of Park, Merchant, Glasgow	1838
Henderson, John Alexander, of Westerton, 4th, or Queen's Own Light Dragoons	1831
Henderson, John Irving, Advocate, Sheriff-Substitute, Dundee	1823
Henderson, Robert, Merchant, Glasgow	1838
Henderson, William, Merchant, Edinburgh	1811
Henderson, William, retired Secretary British Linen Co.	1823
Henry, John, of Corse	1815
Hepburn, John Stewart, of Colquhalzie	1810
Herries, William Young, of Spotts	1823
1000 Heriot, John, at Ladykirk	1828
Heriot, James, of Ramornie, W. S.	1800
Heron, James, of Dalmore	1833
Hewatson, Robert, of Auchenbenzie	1834
Hill, George Gosset, Merchant, London	1823
Hill, Henry David, W. S.	1825
Hill, Lawrence, of Barlanark, Writer, Glasgow	1838
Hill, Norman, of Brownhills, Advocate	1807
Hill, Robert, of Firth, W. S.	1800
Hog, James Maitland, of Newliston	1835

		Admitted
1010	Hood, John, of Stoneridge	1827
	Home, Francis, younger of Cowdenknows	1829
	Home, Colonel James, of Broomhouse	1829
	Home, Lieut.-Colonel J. H., of Bassendean, Grenadier Guards	1834
	Home, Dr James, of Cowdenknows, Professor of Physic in the University of Edinburgh	1799
	Home, John Forman, of Wedderburn	1830
	Home, William Forman, of Billy and Paxton	1823
	Hood, David, of Balluderon	1834
	Hope, Archibald, younger of Craighall and Pinkie	1832
	Hope, James, W. S.	1804
1020	Hope, John, Dean of the Faculty of Advocates	1823
	Hope, Dr Thomas Charles, Professor of Chemistry in the University of Edinburgh	1804
	Horn, John, of Thomanean	1837
	Horne, Archibald, Accountant, Edinburgh	1828
	Horne, Donald, of Langwell, W. S.	1817
	Horne, William, of Scouthell, Advocate, Sheriff of Haddingtonshire	1813
	Horrocks, John, of Tullichewen Castle	1818
	Horsburgh, Major William Henry	1824
	Hosier, James, younger of Newlands, Advocate	1822
	Hotchkiss, James, W. S., residing at Castlemilk	1838
1030	Houldsworth, Henry, of Cranstonhill	1836
	Houldsworth, John, Merchant, Glasgow	1838
	Houldsworth, Thomas, of Coltness, Lanarkshire	1837
	Houston, George, younger of Johnstone, M. P. for Renfrewshire	1838
	Houston, Ludovick, of Johnstone Castle	1823
	Houston, Thomas, at Kintradwell	1821
	Houston, Lieut.-Colonel, of Clerkington	1833
	Howard, Lieut.-Colonel, late North British Staff	1809
	Howden, James, Jeweller, Edinburgh	1827
	Hoyes, John, Forres, late Speaker of the House of Assembly, Grenada	1838
1040	Hughan, Thomas, of Airds	1838
	Hunt, James, of Pittencrief and Logie	1816
	Hunt, William, younger of Pittencrief and Logie	1836
	Hunter, Alexander, W. S.	1824
	Hunter, Andrew, of Bonnington	1819
	Hunter, Charles, residing at Templehall	1826
	Hunter, Charles, of Seaside and Glencarse	1823

	Admitted
Hunter, David, of Blackness	1826
Hunter, James, of Thurston	1812
Hunter, James, of Templehall	1823
1050 Hunter, Captain James, of Auchterarder	1823
Hunter, James, of Hafton	1833
Hunter, John, Wine-Merchant, Leith	1833
Hunter, John, at Ardrossan	1836
Hunter, John, younger of Bonington	1836
Hunter Richard, late Bengal Civil Service	1837
Hunter, William Hugh, Perth	1836
Hunter, William, of Ormiston	1812
Hussey, William, of Newhall, Merchant, Glasgow	1838
Hutchinson, James, Merchant, Glasgow	1838
1060 Hutchison, Graham, Merchant, Glasgow	1838
Hutchison, Robert, Merchant, Glasgow	1838
Hutchison, Robert, younger of Cairngall	1829

I

Inglis, James P., late Merchant, Leith	1806
Inglis, John, of Redhall	1825
Innes, James Rose, of Netherdale	1827
Innes, Lewis, of Balnacraig	1834
Innes, Robert, of Thrumster	1824
Innes, Thomas, W. S.	1837
Innes, William, of Raemoir	1834
1070 Ireland, William, of Barbey	1837
Irvine, Alexander Forbes, of Shivas	1805
Irvine, The Rev. Alexander Robertson, Minister of Foss	1838
Irvine, David Stewart, Merchant, Buchanan Street, Glasgow	1839
Irvine, Patrick, of Inveramsay, W. S.	1827
Irving, John, of Burnfoot	1838
Ivory, James, Advocate	1833
Izett, Chalmers, formerly of Kinnaird	1808

J

JARDINE, Sir William, of Applegirth, Bart.	1823
JOHNSTONE, Sir Frederick George, of Westerhall, Bart.	1838
1080 JARDINE, Sir Henry, of Harwood, Knight	1799
Jameson, Robert, Professor of Natural History in the Uni- versity of Edinburgh	1820
Jardine, James, Civil-Engineer, Edinburgh	1818
Jardine, John, Advocate, Sheriff of Ross and Cromarty	1833

	Admitted
Jardine, Thomas, Moffat	1829
Jerdan, Archibald, of Bonjedward	1831
Jerdan, George, of the Grange, Secretary Union Agricultural Society	1832
Johnston, George, Factor to the Earl of Eglinton	1822
Johnston, Alexander, of Shieldhall, one of the Magistrates of Glasgow	1838
Johnston, Alexander, W. S.	1819
1090 Johnston, Alexander, W. S. Aberdeen	1836
Johnston, George, jun. Edinburgh	1828
Johnston, Henry, Surgeon, Edinburgh	1798
Johnston, James, of Straiton	1823
Johnston, James, of Alva	1828
Johnston, James, Tibbermalloch	1836
Johnston, John James Hope, of Annandale, M. P. for Dumfriesshire	1824
Johnston, John, Factor for the Earl of Glasgow	1833
Johnstone, Andrew, of Halleaths	1838
Johnston, Captain Charles, of Cowhill, R. N.	1830
1100 Johnstone, Thomas, of Underwood, S. S. C.	1812
Johnstone, Walter, of Chapplehill	1829
Johnstone, William, Banker, Girvan	1833
Johnstone, William, Merchant, Greenock	1825
Jollie, Walter, W. S.	1829
Jolly, David Leitch, Grange of Elcho	1829
Jolly, Stewart, Chamberlain to the Duke of Montrose	1827
Jopling, Thomas, Coldstream	1823
Jopp, Alexander, Advocate, Aberdeen	1834

K

† KINNOUL, The Right Honourable Thomas, Earl of	1806
1110 KINTORE, The Right Honourable Anthony, Earl of	1826
KENMURE, The Right Honourable John, Viscount	1828
KELBURN, The Right Honourable James, Viscount	1822
KINNAIRD, The Right Honourable George William, Lord	1830
KERR, The Right Honourable Lord Robert	1808
KENNEDY, The Right Honourable T. F., of Dunure	1812
KINLOCH, Sir David, of Gilmerton, Bart.	1828
KEIR, Major-General Sir William Grant, K. C. B.	1804
Keiller, Alexander, of Gottenburgh, Sweden	1838
Keir, John, of Westfield	1832
1120 Keir, Patrick Small, of Kinmonth, Advocate	1805
Keir, Patrick, younger of Kinmonth, Advocate	1837

		Admitted
	Keith, Alexander, Netherthir'd	1837
	Keith, William, Accountant in Edinburgh	1821
	Kelso, Colonel, William, of Dankeith	1839
	Kennedy, Donald, of Bogbain	1838
	Kennedy, Gilbert, Glasgow	1838
	Kennedy, Hugh Ferguson, of Bennan and Finnarts	1832
	Kennedy, John, of Milton Park, Ardwick House, Manchester	1830
	Kennedy, John, of Underwood, W. S.	1836
1130	Kennedy, Robert Thomson, of Daljarroch	1833
	Ker, James, of Blackshiels	1825
	Kerr, Captain James, of Grange and Carskerdo	1836
	Kerr, James, of Middlebank	1838
	Kerr, Robert, Surgeon, Portobello	1816
	Kerr, William, retired Secretary General Post-Office	1789
	Kerr, William Scott, of Chatto	1833
	Kidd, Alexander, Writer, Edinburgh	1824
	Kilgour, Robert, jun. at Millbank	1826
	King, William, Manufacturer, Glasgow	1839
1140	Kinloch, John, of Kilrie, Lieutenant 2d Life Guards	1829
	Kinnear, Charles, of Kinnear	1824
	Kinnear, Patrick, younger of Lochton	1823
	Kippen, William, of Busbie	1838
	Kirkaldy, James, Blackness House, Dundee	1839
	Knight, George, of Jordantown	1833
	Kyle, Captain Alexander, of Binghill	1835
	LANDSOWNE, The Most Noble Henry, Marquis of, K. G. Honorary Member	1837
†	LOTHIAN, The Most Noble John William, Marquis of	1821
	LAUDERDALE, The Right Hon. James, Earl of, K. T.	1789
1150	LEICESTER, The Right Hon. Thomas William, Earl of, Honorary Member	1837
†	LEVEN and MELVILLE, Right Hon. David, Earl of	1820
	LYNEDOCH, The Right Hon. Gen. Thomas, Lord, G. C. B.	1808
	LOVAT, The Right Hon. Thomas Alexander, Lord	1820
	LIVINGSTONE, Rear-Admiral Sir Thomas, of West Quarter, Bart.	1815
	LAWRIE, Sir Robert, of Maxwelltown, Bart.	1828
	LAUDER, Sir Thomas Dick, of Fountainhall, Bart.	1827
	LEITH, Major-General Sir George, Bart.	1833
	LAMB, Sir Charles, of Beauport, Bart.	1836

		Admitted
	LOCKHART, Sir Norman Macdonald, of Lee and Carnwath, Bart.	1832
1160	LEES, Sir Edward S., Secretary to the General Post-Office for Scotland	1832
	LEITH, Major-General Sir Alexander, of Fresfield, K.C.B.	1811
	LIMOND, Colonel Sir James, late Madras Artillery	1828
	L'Amy, James, of Dunkenny, Sheriff of Forfarshire	1806
	Laidlaw, Robert, at Nethercossock	1833
	Laing, Rev. Francis, of Carselogie	1824
	Laird, David, of Strathmartin	1833
	Lamond, James, of Stranduff	1827
	Lamond, Peter, Brewer, Edinburgh	1820
	Lamont, Alexander, of Knockdow	1819
1170	Lamont, Robert, Writer in Glasgow	1838
	Lang, Alexander, of Overton	1801
	Laurie, Robert, Merchant, Leith	1834
	Laurie, Thomas, Land Valuator, Edinburgh	1829
	Law, Robert, Engineer, Shettleston	1838
	Lawson, Charles, Nursery and Seedsman to the Society	1830
	Lawson, John, younger of Chappelton	1832
	Leadbetter, John, Merchant, Glasgow	1838
	Learmonth, John, of Dean	1814
	Learmonth, Thomas, of Lawrence Park	1824
1180	Legh, Rev. Peter, Golborne Park, Lancashire	1823
	Leighton, William, Factor to the Duke of Hamilton	1821
	Leitch, James, Merchant, Greenock	1831
	Lennie, William, of Ballochneck	1836
	Lennox, James, of Dalskairth	1830
	Lennox, John L. Kincaid, of Kincaid	1824
	Leslie, Angus, Prinsinain	1830
	Leslie, George, of Rothie	1826
	Leslie, H. G., of Dunlugas	1826
	Leslie, William, of Warthill	1826
1190	Leny, James Macalpine, of Dalswinton	1824
	Liddel, Andrew, Merchant, Glasgow,	1839
	Limond, David, of Dalblair	1832
	Lindsay, Lieut.-Col. James, of Balcarras	1823
	Lindsay, John, Corn Merchant, Dundee	1826
	Lindsay, Lieut.-Colonel Martin, 78th Regiment	1816
	Lizars, William Home, Regent Terrace, Edinburgh	1835
	Loch, James, M. P.	1822
	Loch, William, of Rachan	1824
	Lockhart, Alexander Macdonald, M. P. for Lanarkshire	1835

	Admitted
1200 Lockhart, Allan Elliot, of Borthwickbrae	1832
Lockhart, Norman, of Tarbrax	1815
Lockhart, William, of Milton Lockhart	1836
Logan, Alexander, London	1831
Longmore, John Alexander, W. S.	1837
Lorimer, James, of Kellyfield, Factor to the Earl of Kinnoul	1826
Lothian, Edward, Advocate	1805
Louson, David, Town-Clerk of Arbroath	1813
Low, Alexander, Accountant, Edinburgh	1830
Low, David, of Laws, Professor of Agriculture in the University of Edinburgh	1825
1210 Lumsdaine, The Reverend Edwin Sandys, of Blaneſne and Invergelly	1837
Lumsdaine, James, of Lathallan	1833
Lumsden, Benjamin, of Kingsford	1828
Lumsden, Harry Leith, of Auchindoir	1822
Lumsden, Henry, of Tilwhilly	1830
Lumsden, Hugh, of Pitcaple, Sheriff of Sutherlandshire	1825
Lumsden, James, of Yoker Lodge	1838
Lyall, Robert, Factor to Sir J. Carnegie of Southesk, Bart.	1826
Lyell, Thomas, R. N., Kinnordy	1836
Lyon, George, of Glenogle	1809
1220 Lyon, John, High School, Leith	1824
Lyon, John Stewart, of Kirkmichael	1837

M

† MONTROSE, His Grace James, Duke of	1821
MONTROSE, Her Grace Jemima, Duchess-Dowager of	1834
† MORTON, The Right Honourable George Sholto, Earl of	1828
† MORAY, The Right Honourable Francis, Earl of, K. T.	1793
† MANSFIELD, The Right Honourable William, Earl of, K. T.	1803
MINTO, The Right Honourable Gilbert, Earl of, G. C. B.	1808
† MELVILLE, The Right Honourable Robert, Viscount, K. T.	1798
MACDONALD, The Right Honourable Godfrey William Wentworth, Lord	1833
1230 MONTAGUE, The Right Honourable Henry James, Lord	1801
MURRAY, Lieutenant-General the Right Honourable Sir George, G. C. B.	1826
MAITLAND, Captain the Honourable Sir Anthony, R. N.	1831
MAULE, The Honourable Fox, younger of Panmure, M. P.	1831
MACDONALD, Honourable Archibald	1796

	Admitted
MACDONALD, Honourable Dudley	1803
MACKENZIE, The Honourable Mrs Stewart of Seaforth	1816
MEADOWBANK, The Honourable Lord	1800
MACKENZIE, The Honourable Lord	1803
MEDWYN, The Honourable Lord	1802
1240 MONCREIFF, The Honourable Lord	1830
MURRAY, The Right Hon. John Archibald, Her Majesty's Advocate for Scotland, M.P.	1823
MAITLAND, Lieutenant-General the Hon. W. Mordaunt	1827
MELVILLE, The Honourable William Leslie	1833
MURRAY, The Honourable James Erskine, Advocate	1832
MACKENZIE, The Right Honourable Holt	1833
MACKENZIE, Right Hon. J. A. Stewart, of Seaforth	1803
MAXWELL, Sir W. A. of Calderwood, Bart.	1830
MENZIES, Sir Neil, of Menzies, Bart. Hon. Secretary of the Society	1802
MENZIES, The Honourable Lady, of Menzies	1839
1250 MURRAY, Sir William Keith, of Ochertyre	1830
MACKENZIE, Sir George S., of Coul, Bart.	1801
MAXWELL, Sir John, of Pollock, Bart.	1798
MAXWELL, Sir Patrick, of Springkell, Bart.	1830
MACKENZIE, Sir Francis Alexander, of Gairloch, Bart.	1824
MACKENZIE, Sir James Wemyss, of Scatwell, Bart.	1817
MACGREGOR, Sir Evan Murray, of Macgregor, Bart.	1801
MONTGOMERY, Sir James, of Stanhope, Bart.	1801
MAXWELL, Sir David, of Cardoness, Bart.	1810
MACKENZIE, Sir John W. P. M., of Delvin, Bart.	1829
1260 MACKENZIE, Sir Colin, of Kilcoy, Bart.	1801
MENTEATH, Sir Charles Granville Stuart, of Closeburn- hall, Bart.	1803
MILNE, Admiral Sir David, of Milnegraden, K. C. B.	1808
MACDONELL, Major-General Sir James, K. C. B., Cold- stream Guards	1803
MACLEOD, Major-General Sir John, of Unish	1804
Macadam, John, of Blairover	1824
Macalister, Charles S., of Kennox	1806
Macalister, Major James, of Springbank, late 13th Dra- goons	1807
Macalister, Keith Macdonald, of Inistrynish	1829
Macallan, James, W. S.	1823
1270 Macan, Captain John, of Lurgyvallen	1833
Macarthur, Dr Peter, of Delnies	1819
Macaslin, Alex., Nursery and Seed Merchant, Glasgow	1838

	Admitted
Macbarnet, Alexander, of Attadale	1838
Macbean, Æneas, W. S.	1812
Macbean, Duncan, of Tomatin, Merchant, Glasgow	1828
Macbean, Lieutenant-Colonel James, late 78th Regiment	1806
Macbraire, John Joseph, of Tweedhill and Broadmeadows	1832
Macaskill, Hugh, of Tallisker	1830
MacCall, Thomas, of Craighead	1838
1280 MacCheyne, Adam, W. S.	1819
MacCleland, George, W. S.	1838
MacCorquodale, Hugh, Merchant, Liverpool	1803
MacCulloch, John, of Barholm	1810
Macdiarmid, John, Dumfries	1827
Macdonald, Alexander, of Lochsheil	1824
Macdonald, Major-General Alex., Royal Horse Artillery	1810
Macdonald, Dr Alexander, Royal Artillery, Prince Edward's Island	1838
Macdonald, Captain Angus, of Milltown	1798
Macdonald, Angus, of Glenaladale	1827
1290 Macdonald, Archibald, Islay, son of the Honourable Archibald Macdonald	1838
Macdonald, Lieut.-Col. D. Robertson, of Kinlochmoidart	1805
Macdonald, Major Donald, of Ardmore	1822
Macdonald, Captain, Donald, of Isauld, Royal Engineers	1817
Macdonald, Donald, of Craighuie	1829
Macdonald, Donald, of Lochinver	1834
Macdonald, Hugh P., of Mongstad	1830
Macdonald, James, of Dalness, Advocate	1822
Macdonald, James Thomas, of Balranald	1832
Macdonald, Captain John, of Springfield	1797
1300 Macdonald, Lieut.-Colonel John, of Kingsburgh	1797
Macdonald, Colonel John, of Dalchoisnie, 92d Regiment	1819
Macdonald, John, Procurator-Fiscal, Dunfermline	1836
Macdonald, Matthew N. W. S.	1818
Macdonald, Norman, of Barnisdale	1789
Macdonald, Norman, younger of Barnisdale	1834
Macdonald, Major Ranald, late 92d Regiment	1823
Macdonald, Ranald, of Bornish	1806
Macdonald, Reginald George, of Clanranald	1807
Macdonald, Lieut.-Col. of Inchkenneth, Robert, Royal Horse Artillery, C. B.	1814
1810 Macdonald, Thomas, Fort William,	1827
Macdonald, William, of St Martins	1802
Macdonald, Lieut.-Colonel William, of Calley	1813

		Admitted
	Macdonald, William, of Ballishare	1818
	Macdonell, Alexander, W. S. and Sheriff-substitute of Wigtownshire	1832
	Macdonell, Lieut.-Colonel George, Edinburgh	1833
	Macdonell, James, of Milnfield, W. S.	1812
	Macdonell, Captain John, Killyhonet, Fort William	1821
	Macdonal, Lieutenant-Colonel C. B., Stranraer	1824
	Macdonall, James, of Logan	1833
1320	Macdougall, Allan, W. S.	1820
	Macdougall, Colin, of Lunga	1808
	Macdougall, Dugald, of Gallanach	1814
	Macdougall, Captain James Patrick, late H. E. I. C. Service	1838
	Macdougall, Major Patrick, of Soroba	1800
	Macdougall, Alexander, Solicitor, London	1836
	Macdougall, John, of Macdougall, Captain R. N.	1821
	Macdowall, William, of Barr	1830
	Macduff, Alexander, of Bonhard	1811
	Macduff, Captain Alexander, Factor for Lord Glenlyon	1839
1330	Maceachern, Captain Colin, of Oatfield	1823
	Macewan, James, late of Grenada, Teithside, Callander	1834
	Macfarlane, Alexander, of Thornhill	1825
	Macfarlane, John, of Muckroy	1821
	Macfarlane, John Fletcher, Surgeon, Edinburgh	1823
	Macfarlan, The Rev. Dr Patrick, Minister of the West Parish, Greenock	1839
	Macfarlane, Thomas, Clachan	1829
	Macfarlane, William, of Carse of Boquhapple, late 17th Lancers	1832
	Macfie, John, Merchant, Leith	1823
	Macfie, William, yr. of Langhouse, Merchant, Greenock	1826
1340	Macgibbon, Alexander, of Crawhill	1835
	Macgillivray, John L., of Dumnaglass	1838
	Macgillivray, Simon, Merchant, London	1821
	Mackgill, David Maitland, of Rankeillor	1826
	Macgounne, Robert, of Mains	1824
	Macgregor, Alexander, of Garscadden,	1837
	Macgregor, Alexander, jun. Glasgow	1823
	Macgregor, Lieut.-Col. Hugh, late 91st Regiment	1814
	Macgregor, James, Fort-William	1833
	Macgregor, John Atholl Bannatyne, yr. of Macgregor	1832
1350	Macgregor, John, of Glengyle	1832
	Macgregor, Major-General Murray, Bengal Cavalry	1801
	Macilwraith, James, of Auchinflower	1835

	Admitted
Macinnes, James, S. S. C.	1812
Macinnes, John, at Dandaleith	1822
Macinroy, James Patrick, of Lude	1831
Macinroy, William, of Shierglas	1827
Macintosh, Alexander, of Macintosh	1833
Macintosh, Charles, of Campsie and Dunchattan	1838
Macintosh, Æneas, younger of Macintosh	1839
1360 Macintosh, George, younger of Campsie and Dunchattan	1838
Macintosh, William, of Geddes and Hilton	1816
Macintosh, George, younger of Geddes and Hilton	1832
Macintosh, William, of Millbank	1813
Macintosh, Donald, Edinburgh	1816
Macintosh, Lachlan, of Raigmore	1814
Macintyre, Donald, Writer, Glasgow	1818
Macivor, John, of Ardmarnock	1827
Mackay, Lieut.-Colonel Colin Campbell, of Bighouse	1808
Mackay, James, Goldsmith, Edinburgh, the Society's Jeweller and Medalist	1804
1370 Mackay, John, Banker, Inverness	1837
Mackay, Thomas George, W. S., Factor on the Estate of Moncrieff	1837
Mackellar, Rev. Angus, Minister of Pencaithland	1818
Mackellar, Duncan, Merchant, Glasgow	1809
Mackenzie, Alexander, Sheriff-Substitute of Ross-shire	1805
Mackenzie, Alexander, Writer, Perth	1829
Mackenzie, Major Forbes, of Fodderty	1829
Mackenzie, George Falconer, of Allangrange	1819
Mackenzie, George Ross, of Aldie	1819
Mackenzie, George, Dingwall	1830
1380 Mackenzie, James John Randall, younger of Scatwell	1838
Mackenzie, James William, Banff	1825
Mackenzie, John, younger of Glack	1835
Mackenzie, John, Agent at Inverness for the Bank of Scotland	1809
Mackenzie, John, Writer, Edinburgh	1813
Mackenzie, John, Writer, Tain	1835
Mackenzie, John Hay, of Cromartie	1822
Mackenzie, John Whiteford, W. S.	1821
Mackenzie, Kenneth Francis, formerly of Park Place, Edinburgh	1811
Mackenzie, Murdo, at Dundonell	1799
1390 Mackenzie, Richard, of Dolphington, W. S. Depute-Keeper of the Signet	1809

	Admitted
Mackenzie, Robert Duncanson, of Culdarran	1838
Mackenzie, Roderick, of Glack	1790
Mackenzie, Sutherland, Manager of the Scottish Union Insurance Company	1808
Mackenzie, Thomas, of Applecross, M. P. for Ross-shire	1816
Mackenzie, Dr William, of Culbo, Edinburgh	1801
Mackenzie, William, of Muirton, W. S.	1808
Mackenzie, William Forbes, of Portmore, M. P.	1831
Mackerrel, Henry, of Hillhouse	1837
Mackilligan, William, of Relugas	1837
1400 Mackinlay, John, Rothesay	1818
Mackinnon, Alexander Kenneth, of Skalisraig	1827
Mackinnon, Dr Farquhar, of Kyle	1819
Mackinnon, Rev. John, Minister of Slate	1815
Mackinnon, Neil, of Demerara	1819
Mackinnon, William Alexander, of Mackinnon	1811
Macintosh, Charles, of Aberarder	1831
Maclachlan, Colin, Laidle	1836
Maclachlan, Donald, of Scorrybreck	1831
Maclachlan, Dugald, one of the Sheriff-substitutes of Inverness-shire	1832
1410 Maclachlan, Dugald, of Killimore	1838
Maclachlan, Eun, Liddesdale	1836
Maclachlan, Robert, of Maclachlan	1817
Maclaine, John, of Kilundine	1822
Maclaine, Major Lachlan, late 1st Royal Regiment	1836
Maclaine, Murdoch, of Lochbuy	1811
Maclaine, Murdoch, younger of Lochbuy	1835
Maclarty, Colin, late of Jamaica	1808
Maclaren, Charles, Edinburgh	1833
Maclaren, Donald, Agent for the Leith Banking Company at Callander	1832
1420 Maclaren, Duncan, Cambuserricht	1834
Maclaren, James, Gavel House, Kilsyth	1832
Maclean, Colonel Alexander, of Ardgower	1793
Maclean, Alexander, of Carsaig	1835
Maclean, Lieutenant-Colonel Allan Thomas, 13th Light Dragoons	1835
Maclean, Archibald D., Navy Pay-Office, London	1837
Maclean, Colin, of Laggan, Islay	1838
Maclean, Donald, of Boreray	1822
Maclean, Donald, W. S.	1793
Maclean, Hugh, of Coll	1819

		Admitted
1430	Macleane, Hugh, late of Jamaica	1827
	Macleane, Dr Lachlan, Principal Tacksman of Rum	1823
	Macleane, Lachlan, Merchant, Glasgow	1837
	Macleane, Neil, Land-Surveyor, Inverness	1837
	Macleane, William, of Plantation, Glasgow	1838
	Macleish, Adam, Merchant, Greenock	1831
	Maclelland, Thomas, Banker, Ayr	1836
	Macleod, Alexander, Surgeon, Uist	1829
	Macleod, Alexander, of Canada	1811
	Macleod, Alexander Norman, late of Harris	1817
1440	Macleod, Alexander, formerly of Muiravonside	1800
	Macleod, Donald, of Talisker	1800
	Macleod, Donald, at Claggan	1830
	Macleod, Æneas, R. B., of Cadboll	1786
	Macleod, John, of Rasay	1839
	Macleod, Norman, of Macleod	1839
	Macleod, Mrs, Dowager, of Macleod	1816
	Macleod, Martin, Drynoch	1831
	Macleod, Roderick, younger of Cadboll, M. P.	1807
	Macleod, Colonel W. Hon. East India Co.'s Service	1817
1450	Macleod, William, of Orbst	1831
	Maclellan, John, Merchant, Greenock	1831
	Macmillan, Donald, of Lephensrath	1825
	Macmillan, Captain Iver, late of the Valentine Indianman	1798
	Macmillan, James, of Lawloch	1834
	Macmillan, Michael, Merchant, Glasgow	1810
	Macnab, Archibald, of Macnab	1806
	Macnab, Gilbert, Sheriff-clerk Depute, Ayr	1836
	Macnabb, James Monro, Arthurstone	1837
	Macnair, James, of Balvie	1838
1460	Macneale, George, of Ugadale	1825
	Macneill, Captain Alexander, younger of Colonsay	1835
	Macneill, Lieutenant-Colonel Donald, late 91st Regiment	1802
	Macneill, Duncan, Advocate	1833
	Macneill, John, late of Oakfield	1796
	Macneill, Colonel Roderick, of Barra	1817
	M'Neel, Alexander, Collector of Customs, Stranraer	1829
	Macneill, Alexander, Advocate	1835
	Macneill, Malcolm, Lossit, Islay	1835
	Macnicol, John, Factor to the Earl of Airlie	1831
1470	Macnicol, Nicol, Glenbranter, Lieut. Half-pay, H. M. 27th Regiment	1836
	Macnight, Colonel Patrick, of Barns	1836

		Admitted
	Macpherson, Allen, 2 Harley Place, New Road, London	1822
	Macpherson, Allen, Kingussie	1821
	Macpherson, Major-General Duncan, Hon. E. I. C. S.	1825
	Macpherson, Major Evan, of Glentruim, Hon. E.I.C S.	1832
	Macpherson, Ewen, of Cluny Macpherson	1827
	Macpherson, Hugh, of Eigg, M.D. one of the Professors of King's College, Aberdeen	1828
	Macpherson, John, Beaul, Factor for Lord Lovat	1809
	Macpherson, Kenneth, late Member of the Hon. House of Assembly, Jamaica	1826
1480	Macpherson, William, of Blairgowrie	1822
	Macquarrie, Lachlan, of Jarvisfield, Scots Greys	1835
	Macqueen, Captain Simon, Corrybrough	1820
	Macrae, Alexander, of Askernish	1832
	Macrae, Colin, of Demerara	1823
	Macready, Patrick Boyle Muir, of Pierstone	1838
	Macritchie, Charles Elder, Edinburgh	1831
	Macritchie, Thomas, Merchant, Leith	1805
	Macritchie, Thomas Elder, of Craigton, W. S.	1831
	Macrone, James, Crown Agent, Isle of Man	1838
1490	Mactaggart, Captain J. O., late Hon. East India Company's Maritime Service, Ayr	1835
	Mactaggart, John, of Ardwell, M.P.	1839
	Mactier, Anthony, of Durris	1834
	Macturk, Robert, younger of Stenhouse	1826
	Macvicar, Rev. J. G., Dundee	1828
	Madden, Henry R. 28 Warriston Crescent, Edinburgh	1839
	Maitland, Adam, of Dundrenan	1802
	Maitland, William, of Auchlane, Gilston Castle	1825
	Malcom, Neill, of Poltalloch	1830
	Mansfield, John, of Midmar	1827
1500	Mansfield, Thomas, of Scatwell, Edinburgh	1827
	Marshall, Claud, Sheriff-Substitute of Greenock	1819
	Marshall, Henry, Dep. Inspector-General of Hospitals	1833
	Marshall, James, Jeweller, Edinburgh	1833
	Marshall, John, Advocate	1822
	Marshall, Walter, Jeweller, Edinburgh	1839
	Martin, George, Civil Engineer, Glasgow	1839
	Mathieson, William, Merchant, Glasgow	1838
	Maule, William, Dublin Street, Edinburgh	1830
	Maxton, John, Wine Merchant, Leith	1835
1510	Maxtone, Anthony, of Cultoquhey	1812
	Maxwell, Alexander Harley, of Portrack	1834

	Admitted
Maxwell, Henry, Merchant Leith	1830
Maxwell, Henry Constable, of Milnhead	1838
Maxwell, John, younger of Pollock	1825
Maxwell, John, of Westwater	1838
Maxwell, John Argyll, residing at Aros	1834
Maxwell, John Hall, younger of Dargavel, Advocate	1838
Maxwell, John Heron, younger of Kirrouchtree	1839
Maxwell, John Herries, of Munches	1826
1520 Maxwell, Lieut.-Col., of Orchardtown and Gretna	1825
Maxwell, Marmaduke Constable, of Terregles	1830
Maxwell, Wellwood, of the Grove	1838
Maxwell, William, of Carruchan	1837
Maxwell, William Constable, of Nithsdale and Evringham	1830
May, John, of Bradfield, Merchant, Glasgow	1827
Mayne, Major-General John, Hon. E. India Comp. Service, C.B.	1831
Mayne, Robert, 42 Melville Street, Edinburgh	1838
Meason, Magnus Gilbert Laing, of Lindertis	1836
Meek, George, of Campfield	1814
1530 Megget, Thomas, W.S.	1811
Meiklam, James, of Cairnbroe	1831
Meiklejohn, James, Alloa	1833
Mein, Robert, of Ormiston	1838
Melville, John White, of Mount Melville	1819
Menteath, James Stuart, younger of Closeburn Hall	1837
Menzies, Major Archibald, late of the 42d Royal Highland Regiment	1817
Menzies, George Cumming, of Knockintobar	1837
Menzies, James, of Pitnacree	1834
Menzies, John, of Pitfodels	1806
1540 Menzies, John, of Chesthill	1821
Menzies, Robert, Land-surveyor, Dunkeld	1829
Mercer George, of Gorthy	1822
Mercer, Græme, of Mavisbank	1819
Merry, James, junior, Coalmaster, Glasgow	1838
Mill, George, of Blair	1826
Mill, John, Merchant, Edinburgh	1814
Milne, David, younger of Milnegraden, Advocate	1835
Milne, John, Merchant, Grangemouth	1818
Millar, Andrew, Merchant, Edinburgh	1827
1550 Miller, Charles Hagart, of Pleasanthill, W.S.	1834
Miller, George, of Frankfield	1814
Miller, John, of Ballumbie	1834

		Admitted
	Miller, Lieut.-Colonel, of Urquhart	1834
	Miller, Thomas Hamilton, Advocate, Sheriff of Selkirkshire	1804
	Miller, Patrick, Dalswinton	1806
	Miller, William, younger of Glenlee, 12th Royal Lancers	1837
	Miller, William, of Monkcastle, Advocate	1828
	Miln, James, of Woodhill	1837
	Mitchell, Alexander, Civil-Engineer, Perth	1838
1560	Mitchell, Colonel James, late of the 92d Regiment	1821
	Mitchell, John, Merchant, Glasgow, Chief Magistrate of Gorbals	1838
	Mitchell, John, jun., Merchant, Leith	1832
	Mitchell, John, of Bellfield	1836
	Mitchell, Joseph, Civil-Engineer, and Superintendent of the Parliamentary Roads in Scotland	1836
	Mitchell, Patrick, residing at Enzean, Monymusk	1831
	Mitchell, William, of Parson's Green,	1819
	Mitchelson, Arch. Hepburne, of Middleton	1832
	Molle, William, W.S.	1802
	Moir, Charles Alexander, of Leckie	1814
1570	Moir, John, Printer, Edinburgh	1804
	Moir, John Macarthur, of Hillfoot and Milton	1834
	Moir, Walter, Sheriff-substitute, Glasgow	1803
	Moncrieff, Robert Scott, younger of Fossaway, Advocate	1831
	Moncrieff, Robert Hope, Perth,	1825
	Monro, Dr Alexander, Professor of Anatomy in the University of Edinburgh	1807
	Monro, Alexander, younger of Craiglockhart, Rifle Brigade	1835
	Monteath, James, Merchant, Glasgow	1838
	Monteith, Henry, of Carstairs	1808
	Monteith, Robert, younger of Carstairs	1837
1580	Montgomerie, Alexander, Captain R. N., residing at Annick Lodge	1834
	Montgomery, Robert, Stanhope	1829
	Montgomery, William of Bellmont	1836
	Money Penny, Alexander, W.S.	1827
	Monypenny, David, of Pitmilly	1804
	Moore, James Carrick, of Corsewall	1829
	Moore, John Carrick, younger of Corsewall	1839
	Moray, James, of Abercairney	1811
	More, John Shank, Advocate	1816
	Moreland, Charles, Banker, Stranraer	1827
1590	Morrieson, Robert, Hon. E.I.C.S., Edinburgh	1833

		Admitted
	Morrison, Alexander, Writer, Glasgow	1838
	Morton, Sam., Agricultural Implement-Maker, Leith Walk	1822
	Morton, Robert, late Jeweller, Edinburgh	1812
	Morton, Hugh, Engineer, Leith Walk	1835
	Mouat, William Mouat Cameron, of Garth, Captain H. P. 18th Light Dragoons	1838
	Mouat, William Cameron, younger of Garth	1830
	Moubray, James, of Cambus	1838
	Muir, Andrew, Merchant, Greenock	1826
	Muir, James, Merchant, Greenock	1827
1600	Muir, Malcolm, Timber-merchant, Glasgow	1838
	Muirhead, Claud, Publisher of the Edinburgh Advertiser	1820
	Mundell, Robert, L. D. Wallacehall	1831
	Munro, Hugh, of Teaninich	1799
	Munro, Hugh Andrew Johnston, of Novar	1832
	Munro, Alexander, Prince's Street, Edinburgh	1810
	Munro, George Gunn, of Poyntzfield	1837
	Munro, Colonel William, Madras Army	1825
	Murdoch, John Burn, of Gartincaber	1820
	Murdoch, John, Factor for Colonel Hunter Blair of Dunskey	1836
1610	Murdoch, Peter, late of Van Diemen's Land, Cargen House	1839
	Mure, James O. Lockhart of Livingstone	1828
	Mure, William, Factor to the Earl of Selkirk	1830
	Murray, Alexander, of Broughton, M. P.	1822
	Murray, Andrew, of Murrayshall, Sheriff of Aberdeenshire	1804
	Murray, Anthony, of Dollerie, W. S.	1828
	Murray, James, of the Monkland Iron-Works	1828
	Murray, John, 24 Anslie Place, Edinburgh	1837
	Murray, John Dalrymple, of Murraythwaite	1825
	Murray, Joseph, of Ayton	1820
1620	Murray, Patrick, of Simprim	1794
	Murray, Samuel Hood, of H. M. 92d Highlanders	1834
	Murray, William, of Polmaise	1806
	Murray, William of Banknock	1827
	Murray, William, of Henderland	1826
	Mutrie, David, Merchant, Glasgow	1804

N

NORTHLAND, The Right Honourable Thomas, Viscount	1808
NAPIER, Sir William Milliken, of Milliken, Bart.	1820
NASMYTH, Sir John Murray, of Posso, Baronet	1838
NICHOLSON, Sir Arthur, of Lochend, Bart.	1812

	Admitted
1630 Nairn, David, of Drumkilbo	1826
Nairne, James Mellis, of Dunsinane	1821
Nairne, James, of Claremont, W.S.	1829
Napier, Robert, Dunmore, of Ballekinrain	1824
Napier, William, of Blackstone	1815
Neil, Lieut.-Colonel William, of Barweill	1824
Neill, Patrick, LL.D., Secretary Caledonian Horticult. Soc.	1808
Neilson, Robert, of Hilton	1831
Newbigging, John Stewart, W. S.	1836
Newton, James, Merchant, Leith	1838
1640 Newton, Robert Pillans, Factor for Lord Douglas Gordon	
Hallyburton	1837
Nicholson, Major Allan Macdonald, of Ardmore	1819
Nisbet, Archibald, of Carphin	1820
Nisbet, George More, of Cairnhill	1817
Niven, William, of Achalton and Kirkbrido	1812
Noble, John, 90 Gloucester Place, London	1838
Noble, William, 152 Fleet Street, London	1838

O

	Ogilvie, The Honourable William, of Airlie	1823
	Ogilvie, The Honourable Donald, of Clova	1824
	Ogilvie, Sir John of Inverguharity, Bart.	1824
1650	Oswald, Lieut.-Gen. Sir John, of Dunnikier, G.C.B.	1824
	Orde, Sir John Poulet, of Kilmory, Bart.	1830
	Ochterlony, John, of Guynd	1797
	Ogilvy, Charles, of Seafeld, Zetland	1838
	Ogilvie, John, of Inchewan	1836
	Ogilvy, John, of Quarff, Zetland	1838
	Ogilvie, Peter Wedderburn, of Ruthven	1826
	Ogilvy, Thomas, of Corrimony and Lakefield	
	Ogilvie, Captain William, R.N.	1820
	Ogilvie, William, of Chesters, Advocate	1800
1660	Oliphant, Charles, W. S.	1813
	Oliphant, Laurence, of Condie	1828
	Oliphant, James, of Gask	1828
	Oliver, Major Archibald, of Bush	1832
	Oliver, Thomas, Lochend	1825
	O'Reilly, Lieut.-Colonel W. F., Flenrs Castle	1833
	Orr, Charles James Fox, of Thornly Park, W. S.	1816
	Orr, Patrick, W. S.	1825
	Oswald, James, Merchant, Glasgow	1829

		Admitted
	Oswald, Richard Alexander, of Auchincruive	1803
1670	Oswald, Colonel Robert, Dunnikier	1824

P

	PANMURE, The Right Honourable William, Lord	1805
	PRINGLE, Sir John, of Stinchell, Bart.	1810
	Parish, Woodbine, late Chairman of the Board of Excise	1819
	Parkes, Samuel, of London	1817
	Paterson, Alexander, Thurso	1801
	Paterson, George, of Castle Huntly	1804
	Paterson, John, Factor to the Duke of Hamilton in Ayr	1826
	Paterson, John, residing at Borlum	1832
	Paterson, Robert, of Brokelehurst	1835
1680	Patison, John, W.S.	1806
	Paton, John, of Crailing	1833
	Patrick, Captain James, of Drumbowie	1836
	Patrick, John Sheddan, of Trearne and Hazlehead	1833
	Patrick, William, of Roughwood, W.S.	1805
	Patton, James Murray, of Glenalmond	1830
	Paul, Henry, of Woodside, Accountant, Glasgow	1830
	Paul, William, Accountant, Edinburgh	1829
	Pearson, Alexander, W.S.	1819
	Peddie, James, W.S.	1819
1690	Peddie, William, Writer, Perth	1828
	Peebles, Charles, Glasgow	1839
	Pender, Thomas, Comptroller of Stamps and Taxes	1839
	Pennycuik, John, of Soilarie, Major 47th Regiment	1823
	Peter, John, Keithick House	1828
	Phillip, John, Distiller, Dalls	1828
	Pillans, James, Regent Terrace	1799
	Piper, Edward, Edinburgh	1833
	Pitcairn, John, of Pitcairns	1815
	Playfair, William Henry, Architect, Edinburgh	1824
1700	Pollexfen, Thomas, Kirkwall	1839
	Pollock, Arthur, Merchant, Grangemouth	1815
	Pollock, John, Merchant, Glasgow	1838
	Pollok, William, of Barniehill, M.D.	1833
	Pringle, Alexander, of Whytbank, M.P. for Selkirkshire	1821
	Pringle, James, of Torwoodlee	1806
	Pringle, Captain James, R.N., younger of Torwoodlee	1820
	Prentice, Richard, Solicitor-at-law	1817
	Proctor, William, D. of Halkerton	1829

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QUEENSBERRY, The Most Noble John, Marquis of 1825

R.

- 1710 †RICHMOND and LENNOX, His Grace Charles, Duke of, K.G. 1836
 ROXBURGHE, His Grace James Henry, Duke of, 1837
 ROTHES, The Right Hon. George William, Earl of 1837
 †ROSEBERRY, The Right Honourable Archibald John,
 Earl of. 1806
 ROSSLYN, The Right Hon. James Alexander, Earl of, 1835
 REAY, The Right Honourable Eric, Lord 1800
 RUTHVEN, The Right Honourable James, Lord 1810
 ROLLO, The Honourable Roger, 1836
 ROLLO, The Honourable William, Master of Rollo 1838
 RAE, The Right Honourable Sir William, of St Catha-
 rines, Bart, M.P. 1802
 1720 RAMSAY, The Honourable Colonel John, of Dysart 1824
 RAMSAY, Sir James, of Banff, Bart. 1823
 RIDDEL, Sir James Milles, of Ardnamurchan and Sunart,
 Bart. 1808
 RAMSAY, Sir Alexander, of Balmain, Bart. 1813
 RADCLIFFE, Sir Joseph, Bart. of Millsbridge, Yorkshire 1820
 RICHARDSON, Sir John, of Pitfour, Bart. 1823
 RUSSELL, General Sir James, of Ashiesteil, K.C.B. 1832
 ROSE, Major-General Sir John, of Holm and Castlehill, .
 K. C. B. 1831
 ROBISON, Sir John, K.H., Secretary of the Royal Society,
 Edinburgh 1830
 Railton, Edward, Oakfield, Glasgow 1839
 1730 Rait, D. C., Goldsmith, Glasgow 1838
 Ramsay, Alexander, of Demerara 1806
 Rameay, George Williamson, of Maxton and Braidgarhill 1832
 Ramsay, Captain Thomas, Balmain 1828
 Ramsay, William Ramsay, of Barnton 1831
 Ranken, George, of Australia, Drumley, Ayrshire 1839
 Ranken, Thomas S.S.C. 1838
 Rankine, William, M.D., Roddinghead 1836
 Rashleigh, William, yr. of Monabilly, Cornwall 1837
 Rattray, Robert, W.S. 1805
 1740 Rattray, Robert Clerk, of Craighall Rattray 1826
 Rattray, Thomas, younger of Brewlands 1834
 Reid, Dr David Boswell, Edinburgh . 1833
 Reid, Gabriel, of Kilcalmkill 1820

	Admitted
Reid, George, formerly of Ratho Bank	1813
Reid, John, Henderson Row	1813
Reid Sylvester, W. S. Depute Clerk of Teinds	1821
Rennie, Alexander, Solicitor, Inverness	1839
Rennie, William, Banker, Maybole	1836
Renny, Robert Walker, Factor on the estate of Pitfour	1827
1750 Renny, William, of Danevale Park, W. S. Solicitor of Legacy Duties	1820
Renton, Alexander, of Lamberton	1833
Renton, David, of Greystonlees	1834
Reoch, James, Merchant, Leith	1826
Richardson, James, Wine Merchant, Ediuburgh	1833
Richardson, Ralph, Merchant, Edinburgh	1828
Richardson, Robert, Merchant, Edinburgh	1837
Rickman, Thomas, Architect, Birmingham, F. S. A.	1831
Riddell, Campbell D., Advocate	1816
Riddell, Charles, of Meuseley	1831
1760 Riddell, John, Advocate	1817
Ridley, George James, Harbour House, Durham	1833
Rigg, J. Home, of Morton and Downfield	1824
Ritchie, Henry, of Busbie	1820
Ritchie, Robert, Merchant, Edinburgh	1833
Ritchie, Thomas, Bowhouse Farm	1833
Robb, John, of Blackburn, M. D.	1836
Robertson, Alexander, W. S.	1825
Robertson, Andrew, Surgeon at Crathie	1832
Robertson, Charles, at Buttergask	1836
1770 Robertson, David, late Agent for the British Linen Com- pany, Perth	1829
Robertson, Captain George A., of the Honourable East India Company's Service	1817
Robertson George, one of the Deputy-Keepers of the General Records of Scotland	1819
Robertson, George, Factor on the Estates of Brucklay and Fettercairn	1833
Robertson, George Duncan, younger of Strowan, 42d Royal Highlanders	1839
Robertson, Dr Henry, late H. E. I. C. Medical Service, residing at Callander	1832
Robertson, James, Factor in Argyllshire for the Marquis of Breadalbane	1836
Robertson, James Stewart, of Edradynate	1811
Robertson, James Saunders, W. S.	1816

		Admitted
	Robertson, Captain James Walker, R.N.	1823
1780	Robertson, James H., Banker, Greenock	1831
	Robertson, John, Ednam House, Kelso	1831
	Robertson, Captain John, late 14th Foot	1825
	Robertson, Laurence, Cashier for the Royal Bank, Glasgow	1828
	Robertson, Patrick, Advocate	1816
	Robertson, Rebert, of Auchleeks	1828
	Robertson, Thomas, of Cairnmuir	1836
	Robertson, William, younger of Kinlochmoidart, Advocate	1826
	Robertson, William, junior, W. S.	1834
	Robinson, George Garden, Banff	1811
1790	Rodger, Robert, Merchant, Glasgow	1838
	Roger, William, Merchant, Glasgow	1825
	Rogerson, Dr John, of Wamphray	1804
	Rogerson, William, of Gillesbie	1829
	Rolland, Adam, of Gask, W. S.	1837
	Ross, George of Pitcalnie, Rhives	1839
	Ross, Hugh Rose, of Glastullich and Cromarty	1824
	Ross, Colonel John Gray, of Strathgarvie	1836
	Ross, Richard Louthian, of Stafford	1804
	Rowand, Michael, of Linthouse, Banker, Glasgow	1838
1800	Roy, Frederick Lewis, of Nenthorn, W. S.	1837
	Roy, John James, Factor on the estate of Invercauld	1825
	Roy, Robert, W. S.	1822
	Russell, Claud, Accountant, Auditor of Accounts to the Society	1807
	Russell, Francis Whiteworth, Forres House	1835
	Russell, Henry, Merchant, Dumfermline	1836
	Russell, James, of Aden	1834
	Russell, James, of Blackbraes	1834
	Russell, John, W. S.	1806
	Russell, Robert, of Dalnair	1834
1810	Rutherford, William Oliver, of Edgertoun and Dinlabyre	1825

S.

SUSSEX, His Royal Highness Prince Augustus Frederick, Duke of,	1806
*SUTHERLAND, His Grace George Granville, Duke of, President of the Society	1813
SUTHERLAND, Her Grace Harriet, Duchess of	1804
SPENCER, The Right Honourable John Charles, Earl, Honorary Member	1837

	Admitted
STRATHMORE, The Right Honourable Thomas, Earl of	1820
SELKIRK, The Right Honourable Dunbar James, Earl of	1830
STIRLING, The Right Honourable Alexander, Earl of	1825
†STRATHALLAN, The Right Honourable James, Viscount	1811
†SALTOUN, The Right Honourable Alexander George Lord	1820
1820 STORMONT, The Right Honourable David, Lord Viscount, M. P.	1833
SINCLAIR, The Right Honourable Charles, Lord	1829
SCOTT, Right Honourable Lord John,	1833
STUART, The Right Honourable Lord James, M. P.	1819
SILVESTRE, The Baron de, Member of the Institute, Perpetual Secretary of the Royal and Central Society of Agriculture, Paris, Honorary Member	1836
SCOTT, The Honourable Henry Francis, of Harden	1829
SHEPHERD, The Right Honourable Sir Samuel	1820
STEVENSON, His Excellency Alexander, Minister Plenipotentiary from the United States of America, Honorary Member	1839
STUART, The Honourable Charles	1826
STUART, The Honourable Lieutenant-General Patrick	1833
1830 STUART, The Honourable John	1824
SANDILANDS, The Honourable Robert, of Torphichen	1831
STUART, Sir Henry M. Seton, of Allanton and Touch, Bart.	1835
SETON, Sir William C., of Pitmedden, Bart.	1834
SINCLAIR, Sir John Gordon, of Stevenston and Murkle, Bart.	1832
SINCLAIR, Sir George, of Ulbster, Bart. M.P. for Caithnesshire	1812
STIRLING, Sir Samuel, of Glorat, Bart.	1809
SCOTT, Sir William, of Ancrum, Bart.	1829
STEWART, Sir William Drummond, of Ghandtully and Logiealmond, Bart.	1839
STIRLING, Sir Gilbert, of Rosehall and Larbert, Bart.	1806
1840 SUTTIE, Sir George Grant, of Balgone and Preston-grange, Bart.	1839
STRATON, Lieut.-General Sir Joseph, of Kirkside, C.B.	1827
Sadler, Thomas, Norton-Mains, Edinburgh	1838
Salmon, Henry, Banker, Falkirk	1834
Sandeman, David, W. S.	1831
Sanders, James, M. D. Edinburgh	1818
Sandford, Erskine Douglas, Advocate	1827

		Admitted
	Sandilands, Captain William, of Barneyhill, 7th Dragoon Guards	1838
	Sands, James, at Blarcessnock	1817
	Sawers, John, of Loanhead, Procurator-Fiscal, Stirling- shire	1834
1850	Scarth, James, Banker, Leeds	1828
	Scales, Andrew, of the Customs, Leith	1828
	Scot, Alexander, of Trinity Mains, W. S.	1818
	Scotland, John, Factor to Lord Douglas	1835
	Scott, Alexander, of Knockhill, Billam, Langholm	1839
	Scott, Charles, Merchant, Greenock	1831
	Scott, David, of Bengal Civil Service	1823
	Scott, Lieutenant-Colonel George, Edinburgh	1821
	Scott, James, of Brotherton	1805
	Scott, John, of Hawkhill, Merchant, Greenock	1826
1860	Scott, Captain Robert, of Abbethune	1826
	Scott, Robert Haldane, of Kinloss and Wodden	1832
	Scott, General Thomas, of Malleny	1824
	Scott, Thomas Rennie, Factor to Lord Douglas	1827
	Scott, William, of Tiviotbank, W. S.	1835
	Scott, William, of Craigmuaie	1838
	Sellar, Patrick, of Westfield	1813
	Seton, Archibald Macdonald Stenart, Touch,	1835
	Shairp, Major Norman, of Houston	1828
	Shand, William, late of Arnhall	1827
1870	Shanklie, John, Merchant, Edinburgh	1831
	Sharp, Thomas, Manufacturer, Paisley	1839
	Sharpe, Lieutenant-General M. of Hoddam, M. P.	1830
	Shawe, R. F. of Brantingham, Thorpe, near Hull	1838
	Shaw, Charles, W. S. Factor for Lord Macdonald in Skye	1835
	Shaw, David, W. S. Ayr	1836
	Shaw, Duncan, Factor to Lord Macdonald	1815
	Shaw, Captain George, Culblair	1839
	Shaw, John, Writer, Cupar	1836
	Shaw, Patrick, Advocate	1835
1880	Shearer, James, retired Surveyor, G. P. Office	1800
	Shepherd, James, W. S.	1828
	Sheriff, Charles, Sheriff-substitute, Orkney	1829
	Sheriffs, David, Barnyards	1837
	Short, Francis, of Courance	1804
	Silver, George, of Netherley and Balnagubs	1835
	Sim, Adam, of Coulter Mains	1836
	Simpson, Alexander, at Helmsdale	1821

		Admitted
	Simpson, Alexander, Leith	1828
	Simpson, Alexander Horatio, Paisley	1830
1890	Simpson, Robert, of Cobairdy	1839
	Simpson, William, Advocate, Aberdeen, Procurator- Fiscal for Aberdeenshire	1835
	Sinclair, Alexander, son of the late Right Honourable Sir John Sinclair, Bart.	1839
	Sinclair, Dugald, Kilchamaig	1826
	Sinclair, James, of Forss	1830
	Sinclair, John, of Barrock	1824
	Sinclair, John, of Lochaline	1834
	Sinclair, John, of Redcastle	1837
	Sinclair, J. W. of Freswick	1832
	Sinclair, Robert, Merchant, Greenock	1826
1900	Singer, Reverend William, D.D. Kirkpatrick-juxta	1808
	Skelton, George, of Invernettie Lodge	1837
	Skene, George, younger of Rubislaw, Advocate	1831
	Skene, Patrick George, of Hallyards	1825
	Skene, William F., W. S.	1831
	Skinner, C. G. Macgregor, late Captain 1st Dragoon Guards	1823
	Skinner, James, at Drumin, Factor to the Duke of Rich- mond	1827
	Sligo, George, of Auldham	1827
	Sligo, John, of Carmyle	1827
	Small, Patrick, of Diranean	1826
1910	Smith, Alexander, of Glenmillan, Advocate, Aberdeen	1822
	Smith, Archibald, younger of Carbeth-Guthrie	1838
	Smith, Charles Hope Johnstone, Garden Architect, Edin- burgh	1836
1920	Smith, David, W. S.	1833
	Smith, George, Moffat, Surgeon, R. N.	1829
	Smith, George Campbell, Land-Surveyor, Banff	1837
	Smith, James, of Jordanhill,	1823
	Smith, James, Manager of the Deanston Cotton-Works	1821
	Smith, James, of Craigend	1825
	Smith, James, Architect, Glasgow	1838
1920	Smith, John, younger of Crutherland	1838
	Smith, Thomas, Banker, London	1790
	Smith, Thomas, at Penfillan	1834
	Smith, William, Merchant, Glasgow	1823
	Smyth, Robert Gillespie, of Gibleston	1834
	Smollett, Admiral J. R., of Bonhill	1818

		Admitted
	Smollett, Alexander, younger of Bonhill, Advocate	1826
	Sommerville, James, Merchant, Glasgow	1838
	Spear, Robert, Merchant, Glasgow	1838
	Spear, Thomas, Merchant, Glasgow	1838
1930	Spearman, Henry John, of Thornley Hall, Durham	1835
	Speid, Robert, of Ardovie	1819
	Speirs Alexander, of Elderslie, M. P.	1838
	Speirs, Graham, Advocate, Sheriff of Moray and Nairn-shires	1836
	Speirs, Thomas Dundas, Elderslie	1838
	Spens, Lieutenant-Colonel James, late 73d Regiment	1790
	Spottiswoode, John, of Spottiswoode	1812
	Spottiswoode, John Brodie, of Muiresk	1834
	Sprot, James, of Spot	1830
	Sprot, John, Rutland Square, Edinburgh	1830
1940	Sprot, Mark, of Garnkirk, Advocate	1820
	Sprot, Mark, of Riddell	1830
	Sprot, Thomas, W. S.	1826
	Stables, William Alexander, of Park	1836
	Stavert, Thomas, of Hosecoat	1827
	Steele, William, Advocate	1828
	Stein, Charles, of Hattonburn	1837
	Stephen, Moses, of Bellahouston, Advocate	1832
	Stephens, Henry, Redbrae Cottage, Bonnington	1826
	Stephens, George, Land-Drainer, Member of the Swedish Academy of Agriculture, &c.	1837
1950	Stevenson, Alexander, S.S.C.	1813
	Stevenson, Alexander, Banker, Langholm	1839
	Stevenson, Duncan, Printer to the University of Edin.	1824
	Stevenson, Captain Hugh, late Argyllshire Militia	1805
	Stevenson, Nathaniel, of Braidwood	1838
	Stevenson, Robert, Civil-Engineer, Edinburgh	1807
	Stevenson, Thomas, Merchant, Leith	1831
	Steuart, Patrick, of Auchlunkart	1800
	Steuart, Robert, of Alderston, M. P.	1828
	Steuart, Alexander, of Dercullich	1805
1960	Stewart, Alexander, Factor for the Duke of Sutherland, Scourie District	1838
	Stewart, Alexander, of Glencribisdale	1839
	Stewart, Charles, of Ardsheal	1794
	Stewart, Charles of Hillside	1823
	Stewart, Charles, at Chesthill	1834
	Stewart, Donald, Factor on the estate of Harris	1817

	Admitted
Stewart, Captain Dugald	1799
Stewart, George, Grandtully	1838
Stewart, Henry, of Saint Fort	1837
Stewart, Henry Black, of Balnakieley	1838
1970 Stewart, Captain Houston, of Gart, R. N.	1822
Stewart, James, Merchant, Greenock	1825
Stewart, James, of Gillenbie	1838
Stewart, John, of Belladrum	1819
Stewart, John Lorn, of Glenbuckie	1824
Stewart, John, of Dalguise	1823
Stewart, John Shaw, Advocate, Sheriff of Stirlingshire	1816
Stewart, John, of Findynate, M. D., R. N.	1839
Stewart, John, of Fasnacloich	1817
Stewart, John, of Binny	1809
1980 Stewart, Captain John, of the Pr. of Wales Excise Yacht	1809
Stewart, John, of Crossmount	1801
Stewart, John, of Achadaslenaig	1824
Stewart, Major Ludovic, at Pittyvaich	1806
Stewart, Mark S. of Southwick	1837
Stewart, Patrick Maxwell, Merchant, London	1813
Stewart, Pat. G., Agent for the Bank of Scotland, Perth	1829
Stewart, Robert, of Ardvorlich	1823
Stewart, Robert, of Stewarthall	1825
Stewart, Robert of Carfin, W. S.	1833
1990 Stewart, Stair, of Physgrill	1828
Stewart, William of Glenormiston	1833
Stewart, William, Sheriff-clerk, Kincardineshire	1825
Stewart, William, Mains of Skellater	1829
Stewart, William, W. S.	1833
Stirling, General A. Graham, of Duchray and Auchyle	1801
Stirling, Alexander Gartshore, of Craigbarnet	1818
Stirling, Charles, of Gargunnoch	1836
Stirling, Charles Sylvester Douglas, of Glenbervie	1837
Stirling, John, of Kippendavie	1833
2000 Stirling, Thomas Graham, younger of Strowan	1839
Stirling, Major William Moray, of Ardoch	1825
Stirling, William, of Content	1823
Stocks, David, of Invernyte	1836
Stocks, James, Land-Surveyor, Kinross	1837
Stoddart, Alexander, of Ballendreck	1829
Stodart, John, Cartland Mains	1829
Stott, Gibson, of Balloch Castle	1832
Strachan, James, of Cortes	1838

		Admitted
	Strang, William, Lopness, Orkney	1819
2010	Stronach, John, at Muirfold, Factor to the Earl of Fife	1823
	Stuart, Alexander, of Laithers	1835
	Stuart, Charles, of Ballahulish	1827
	Stuart, James, S. S. C.	1822
	Sutherland, Captain George Mackay, of Udoll	1832
	Swan, James, W. S.	1813
	Swinton, Archibald, W. S.	1800
	Swinton, George, late Chief Secretary to the Supreme Government of India	1834
	Swinton, John, Inverleith Place	1810
	Swinton, Samuel, of Swinton	1829
2020	Syme, James, Professor of Clinical Surgery, University of Edinburgh	1838
	Symons, John, M. D., Dumfries	1829

T

†	TWERDALE, Most Noble George. Marquis of, K. T.	1809
	TRAQUAIR, The Right Honourable Charles, Earl of	1811
	TALBOT, The Right Honourable John, Earl of, K. P., Honorary Member	1827
	TORPHICHEN, The Right Honourable James, Lord	1821
	THRIEPLAND, Sir Patrick Murray, of Fingask, Bart.	1824
	Tait, George Advocate	1808
	Tait, George, of Langrig	1825
	Tait, John, Advocate, Sheriff of Kinross and Clackmannan	1834
2030	Tawse, Andrew, W. S.	1836
	Tawse, John, Advocate, Secretary to the Society for propagating Christian Knowledge	1825
	Taylor, Major Alexander Francis, Rothiemay House	1814
	Taylor, Robert, of Broomlands	1833
	Taylor, Robert, of Kirktonhill	1837
	Taylor, William, Merchant, Leith	1828
	Tennant, John, of St Rollox	1833
	Tennant, Charles J., St Rollox, Glasgow	1838
	Tennant, Hugh, of Well Park, Glasgow	1838
	Thom, Robert, of Ascog	1818
2040	Thomson, Alexander, of Banchory	1821
	Thomson, Alexander, Banker, Greenock	1825
	Thomson, Alexander, of Whiteriggs	1838
	Thomson, George, of Burnhouse, Advocate	1834
	Thomson, James, younger of Earnslaw	1828
	Thomson, John, Bookseller, Edinburgh	1811

		Admitted
	Thomson, John, Craigie	1836
	Thomson, John, Cashier of the Royal Bank of Scotland	1833
	Thomson, Peter, Hangingside	1838
	Thomson, Robert, Advocate, Sheriff of Caithness	1835
2050	Thomson, Thomas, Advocate, Principal Clerk of Session	1807
	Thomson, William, of Woodhouse	1828
	Threshie, David Scott, W. S.	1824
	Threshie, Robert, of Barnbarroch	1835
	Tod, Hugh, W. S.	1817
	Tod, John, of Kirkhill, W. S.	1838
	Tod, Peter, of Meikleholmside	1829
	Todd, John, of Finnick, Mellise, by Dumbarton	1838
	Torrance, George Macmikin, of Kilsaintninian	1827
	Torrance, Thomas, Meadowhead	1831
2060	Torrance, William, Gilmerton	1831
	Torrie, Thomas Jameson, Advocate	1837
	Trail, George, younger of Ratter	1822
	Trail, James, of Ratter	1797
	Trail, Thomas Stewart, M. D., Professor of Medical Jurisprudence in the University of Edinburgh	1834
	Trail, William, of Woodwick, Orkney	1821
	Trotter, Alexander, of Dreghorn	1822
	Trotter, Archibald, yr. of Dreghorn	1839
	Trotter, Captain Robert Knox, of Ballindean	1829
	Trotter, John P., Advocate, Sheriff-Substitute, Dunblane	1831
2070	Trotter, Richard, of Mortonhall, Advocate	1836
	Trotter, Thomas, younger of Crookfield, W.S.	1828
	Turnbull, Archibald, of Bellwood	1826
	Turnbull, George, of Abbey St Bathans, W. S.	1833
	Turnbull, Joseph, Bonhill Place, by Dumbarton	1838
	Turner, Geo. of Menie, Lieut-Col. Royal Horse Artillery	1828
	Turner, William, Surgeon, Greenock	1831
	Tyler, William Fraser, of Balnain and Burdsyards, Sheriff of Inverness-shire	1802

U

Urquhart, Beauchamp Colclough, of Byth and Moldrum 1834

V

	Veitch, James, of Elliock	1822
2080	Veitch, John, of Woodside, Merchant, Leith	1833
	Vere, Daniel, of Stonebyres, Advocate	1807
	Vere, James J. Hope, of Cruigiehall	1816

W

	WELLINGTON, Field-Marshal His Grace Arthur, Duke of, K. G. &c. Honorary Member	1815
†	WEMYSS and MARCH, The Right Hon. Francis, Earl of	1798
†	WILLOUGHBY DE ERESBY and GWYDIR, The Right Honourable P. Drummond Burrell, Lord	1808
	WESTERN, The Right Hon. John Lord, Honorary Member	1837
	WARRENDER, The Right Hon. Sir George, of Lochend, Bart.	1804
	Wood, Commissary-General Sir Gabriel, Knight	1830
	Waddell, George, of Ballochnie, W. S.	1824
2090	Waddell, William, of Easter Moffat, W. S.	1818
	Waldie, Archibald, Agent for the Commercial Banking Company, Kelso	1824
	Waldie, John, of Henderside	1826
	Walker, Archibald, Auchtermuchty	1837
	Walker, Bethune, of Fallfield,	1835
	Walker, David, Civil-Engineer and Land-Surveyor, Aberdeen	1831
	Walker, James, Suttie, Fintray,	1835
	Walker, James, of Dalry, Sheriff of Wigtonshire	1835
	Walker, John, of Crawfordton	1834
	Walker, Robert, at Ferrygate	1834
2100	Walker, William, of Bowland	1835
	Walkinshaw, Daniel, Merchant, Glasgow	1838
	Wallace, Robert, of Kelly, M. P.	1825
	Wardrop, John, Banker, Edinburgh	1807
	Wason, Rigby, of Mayfield	1836
	Watson, Hugh, Keillor Farm	1828
	Watson, John, Manager of the Edin. Gas Light Comp.	1825
	Watson, William Dickson, late of Press	1810
	Watt, James, of Crawfordsdyke	1825
	Watt, Robert, Factor on the estates of Closeburn and Mansfield	1835
2110	Wauchope, George, Moray Place	1824
	Wagh, John, Bookseller, Edinburgh	1828
	Webster, William, Factor to W. F. Campbell, Esq. of Islay	1838
	Wedderburn, David, of Pearsie	1831
	Wedderburn, Henry S. of Wedderburn and Birkhill	1819
	Wedderburn, John, Devonshire Street, Portland Place, London	1819

		Admitted
	Weir, Thomas, of Bogangreen	1835
	Welsh, David, of Collin, W. S.	1830
	Welsh, James, at Earlshaugh	1826
	Welsh, John, W. S. Sheriff-clerk of Peeblesshire	1833
2120	Welsh, Robert, S. S. C.	1830
	Wemyss, James Erskine, of Wemyss, Capt. R. N., M. P. for Fifeshire	1823
	Wemyss, The Rev. James, of Orwell	1837
	Wemyss, William, Cuttlehill	1829
	Wetherell, William, Land-Agent, Durham	1836
	Whigham, George, of Hallidayhill	1816
	Whigham, Robert, of Lochpatrick, Advocate	1827
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PREMIUMS

OFFERED BY

**THE HIGHLAND AND AGRICULTURAL
SOCIETY OF SCOTLAND,**

FOR PROMOTING

**AGRICULTURE AND INTERNAL IMPROVEMENT
IN SCOTLAND,**

IN

1838.

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PRELIMINARY NOTICE.

The business of THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND is conducted by a President, Four Vice-Presidents, Thirty Ordinary, and Ten Extraordinary Directors, a Treasurer, an Honorary Secretary, and a Secretary, to which last all communications are addressed. The Ordinary Directors are subdivided into Committees for the dispatch of business, assisted occasionally by those Ordinary Members most conversant with the subjects to be discussed. The Report of each Committee is brought before the Directors collectively for farther procedure, and these proceedings are again submitted for approbation to a half-yearly General Meeting of the Society. One of the General Meetings is, by the Charter, appointed to be holden on the second Tuesday of January; the other on such lawful day in the months of June or July as the Directors may fix. New Members are admitted at either of these General Meetings by ballot. They pay a small annual contribution of £1 : 3 : 6, or, in their option, and in full of all future claims, a life subscription of Twelve Guineas. The annual Subscription is payable in advance, and is expected to be so paid or remitted, by the Members who are liable in it, without expense to the Society. All Meetings of Directors, or Committees, are open; and at these any member may attend and deliver his opinion on the subjects under consideration, though, in cases of division, the Directors or Members of the Committees only are entitled to vote. Members have access to the Society's Library, which is annually increasing, by the purchase or donation of books connected with the purposes of the Institution.

When the Highland and Agricultural Society of Scotland was instituted in the year 1784, the object chiefly contemplated was the improvement of the Highlands, and hence the name—THE HIGHLAND SOCIETY OF SCOTLAND—which it then assumed. But the great increase in the number of its Members since that time, the happy management of its funds, and the change in the general state of the country, have long enabled it to extend the design of its first institution, and direct attention to every part of North Britain where industry might be excited or the useful arts improved. In accordance with this extension of the purposes of its institution, the Society, in the Supplementary Charter lately obtained, has been named THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The Society has, neither by its Charters of Incorporation, nor by its practice, been limited in its patronage to any one department of industry; but it has regarded, as the fitting objects of encouragement, every application of useful labour which might tend to the general good. But although its patronage be thus extended as regards its objects, circumstances have arisen to modify, in some cases, the application of it. The establishment of certain Boards, for the encouragement of the Herring Fishery, and the like, has induced the Society to restrict its original views, and to devote its attention, and apply its funds, in a more special manner, to other objects, and chiefly to Agricultural and Rural Economy in their various branches.

In fulfilment of its purposes, the Society is every year accustomed to offer and award a variety of Premiums, as the means of eliciting and diffusing knowledge

as incitements to industry, or as the rewards for useful undertakings. These relate to every subject which may be supposed to fall within the plan of the Institution:—such are, the Improvement of Waste Lands by Tillage, by Irrigation, or by Draining, the development of the Mineral products of the country, the extension of Plantations, as the objects of ultimate profit, or of present embellishment and shelter,—the improvement of the breeds of Live Stock, and of the qualities of Wool,—the encouragement of certain domestic Manufactures,—and, not the least in interest and importance, the awakening the industry of the Lower Ranks to such pursuits as shall promote their content, by ameliorating their condition. A Mechanical Department exists for rewarding the original invention or subsequent improvement of all machines and implements for Agricultural purposes, the construction of those for other branches of Rural Economy, and of some for domestic convenience. Models of these are received and preserved in the Society's Museum: and descriptions of all such as merit attention are as speedily as possible conveyed to the Public.

Although certain subjects be thus selected as the objects of experiment or discussion, the patronage of the Society is not restricted to these objects. Its purposes being the promotion of general industry and improvement, it receives with favour every beneficial communication, and every statement of facts which may admit of an useful application.

The Papers of the Society are printed periodically in "*THE QUARTERLY JOURNAL OF AGRICULTURE, AND THE PRIZE-ESSAYS AND TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND,*" published by Messrs Blackwood of Edinburgh, Mr CADELL of London, and Messrs CURRY & Co. of Dublin.

All Communications relating to Premiums, as well as Papers or Reports for publication in the Transactions of the Society, and other subjects for the consideration of the Directors, are to be addressed to *SIR CHARLES GORDON*, the Secretary of the Society, at the Society's Hall, Albyn Place, Edinburgh.

NOTICE TO CANDIDATES,

AND GENERAL RULES FOR COMPETITION.

WHEN subjects are specially selected for competition, it is always to be understood, *1st*, That however concisely the subjects themselves be announced, ample information is required concerning them; *2d*, That this information shall be founded on experience or observation, and not on simple references and quotations from books; *3d*, That it shall be digested as methodically as possible; and *4th*, That Drawings, Specimens, or Models, adapted to a defined scale (3 inches to the foot if convenient), shall accompany writings requiring them for illustration.

Certain conditions are annexed to each of the various subjects of competition, as detailed in the List of Premiums; and these are rigidly enforced by the Society, as the only means of ensuring regularity in the conduct of the business, and of distributing exact justice among the competitors.

In all Essays for competition, it is expected that when facts not generally known are stated, they will be authenticated by proper references. Competitors in Essays are not to communicate their names, but shall transmit along with the Essays a sealed note containing their names and addresses, and inscribed on the back with some distinguishing motto or device, which shall also be inscribed on the Essay. When this regulation is neglected, such Essay shall not be received in competition. If the Essayist has formerly gained a premium from the Society for a paper communicated by him, it is recommended that his subsequent Essay shall be written in a different hand from that of the former successful paper.

None of the sealed notes, except those that bear the distinguishing motto or device of the Essays found entitled to premiums, will be opened, and the sealed note will not in any instance be opened, without the consent of the author, unless a Premium equal to at least one-half of the sum offered shall have been adjudged. But should no application be made for the paper on or before the 1st of March in each year, it will be held as belonging to the Society on the terms proposed. Such Essays as are not found entitled to any Premium, will, with the sealed notes be returned to the authors, if required. The Society is to be at liberty to publish the Essays, or extracts from them, for which the Premium, or part of it, shall be awarded.

Candidates are requested to observe, that, in any instance, when Essays, Reports, or Certificates are unsatisfactory, the Society is not bound to give the reward offered; and that in certain cases power is reserved of giving such part only of a Premium as the claim may be adjudged to deserve; but competitors may feel assured that the Directors will always be inclined to judge liberally of their several claims.

Competitors will understand it as a condition having reference to every premium and reward offered by the Society, that the decisions of its Committees and Board of Directors, as confirmed by the Society, are to be final and conclusive, and that it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

In all Reports of Experiments relating to the Improvement or Management of Land, it is expected that the expenses shall be accurately detailed. When Machines or Models are transmitted, it must be stated whether they have been elsewhere exhibited or described.

In all Premiums offered, having reference to Weight or Measure, the New or Imperial Standards are alone to be understood as referred to; and Competitors are required to state their calculations according to these, the only legal standards, otherwise the claim will not be entertained.

When the Premiums are awarded in Plate, the Society will in such cases as the Directors may see proper, allow them to be paid in money, on the application of the successful Candidates.

The Premiums awarded by the Society are payable after the 10th February, for the preceding year.

ESTABLISHMENT FOR 1838.

President.

HIS GRACE GEORGE GRANVILLE, DUKE OF SUTHERLAND.

Vice-Presidents.

1837. **THE MOST HONOURABLE GEORGE, MARQUIS OF TWEEDDALE, K. T.**

1837. **THE MOST HONOURABLE JOHN, MARQUIS OF BUTE.**

1838. **HIS GRACE JAMES, DUKE OF MONTROSE.**

1838. **THE RIGHT HONOURABLE ARCHIBALD JOHN, EARL OF ROSEBURY.**

Extraordinary Directors.

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CLAUD RUSSELL, Esq. Accountant.

The Very Reverend GEORGE H. BAIRD, D.D. Principal of the University of Edinburgh, Chaplain.

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Mr CHARLES LAWSON, Nursery and Seedman, and Curator of Plants and Seeds.

Mr JAMES SLIGHT, Curator of the Museum of Models.

Mr WILLIAM DICK, Lecturer at the Veterinary School.

Ordinary Directors,

ACCORDING TO PRIORITY IN DATE OF ELECTION.

ARCHIBALD BELL, Esq. Sheriff of Ayrshire.
 ALEXANDER DUNLOP, Esq. Advocate.
 WILLIAM GRIERSON, Esq. of Garroch.
 PATRICK SMALL KEIR, Esq. of Kinmonth.
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 GEORGE MACMILKIN TORRANCE, Esq. of Kilsaintninian.
 RICHARD HUNTER, Esq. late Bengal Civil Service.
 R. CUNNINGHAME BONTINE, Esq. of Ardoch.

Chairmen of Standing Committees 1838.

Funds and Accounts..... Sir JOHN STUART FORBES, Bart.
Publications and Papers... DAVID LOW, Esq. F.R.S.E., Prof. of Agriculture.
Mechanics..... JOHN ROBISON, Esq. K. H. Sec. Royal Soc. Edinburgh.
Geology..... DAVID MILNE, Esq. Advocate.
The Veterinary School..... JOHN BURN MURDOCH, Esq. of Coldoch.
Regulations for General Shows of Live-Stock, } G. MACMILKIN TORRANCE, Esq. of Kilsaintninian.
The Argyll Naval Fund,... P. SMALL KEIR, Esq. of Kinmonth.

PREMIUMS, &c.

*SOCIETY'S HALL, ALBYN PLACE,
EDINBURGH, 5th February 1838.*

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND does hereby advertise, That the under-mentioned PREMIUMS are to be given by the Society in the year 1838, &c.

CLASS I.

AGRICULTURAL MACHINERY.

1. APPLICATION OF STEAM TO THE CULTIVATION OF THE SOIL.

A Premium of Five Hundred Sovereigns will be awarded for the first successful Application of Steam-Power to the Cultivation of the Soil.

By the cultivation of the soil are to be understood the operations of ploughing and harrowing, or preparing the soil in an equally efficient manner, and the other purposes for which animal power is now used: and the success of the invention will be judged of in relation to its applicability to the above purposes in the ordinary situations of farms in this country, and to the saving *in time, labour, and outlay*, which it may possess over animal power, as now generally employed in the cultivation of the soil.

The merits of the invention, with reference to the conditions enumerated, will be judged of by a Committee of the Society specially appointed, and the inventor will be required to exhibit the machinery and modes of applying it, in Scotland. Sir

Charles Gordon, the Secretary of the Society, on application of intending Competitors, will furnish any information which may be required.

The Society, in offering this Premium, does not feel it to be necessary to express opinions as to the probability of a successful application of steam to tillage, as to the means by which the object may be attained, or as to the effects which might be supposed to result from the application of such a power. But it has felt it to be a duty imposed upon it by its situation, to bring the subject in a proper manner before the country, to encourage those who are now engaged in this class of experiments, and to stimulate future invention by the offer of a premium corresponding, in some measure, to the interest and importance of the subject. Looking to the vastly extended application which has recently been made of steam as a motive power, and seeing that the difficulties which are opposed to its application to the purposes of the farm have been at least partially overcome by the efforts of individuals, it has appeared to the Society, that, without exciting expectations which may not be realized, a strong ground exists for having this possible application of steam-power made the subject of fair and satisfactory experiment.

2. IMPLEMENT FOR CUTTING DRAINS.

The Gold Medal, or a Piece of Plate of that value, will be given for an implement or implements, worked by horses, which shall produce the greatest saving in the expense at present incurred by manual labour in cutting drains in land where the subsoil is of a retentive nature.

Evidence must be produced that the invention is new, and specific information given as to the time when the implement was first used.

Models and descriptions, with certificates of the efficiency of the implement, to be lodged, as after specified, with reference to, implements submitted for the premium No. 4.

3. A RIGHT AND LEFT MOULD-BOARD PLOUGH.

To facilitate the subsoil and trench ploughing of land upon a considerable declivity, where it is of importance, as economising labour, to plough a right angles to the slope, it has been suggested that a plough to precede the subsoil or trench plough, constructed with a mould-board or mould-boards, capable of shifting with simplicity, so as to throw the furrow slice either to the right

or to the left, that it may always be turned in the direction of the natural slope, would secure the object desired :—

Ten Sovereigns, or a Piece of Plate of that value, will therefore be given for the Plough constructed on the best principles that shall be proved to perform the work referred to in an efficient manner.

The Competitors to exhibit their Ploughs at the General Show of Live Stock at Glasgow, in autumn 1838,—with certificates from at least three practical agriculturists, who have seen the Plough at work, with their opinion of its efficiency.

4. INVENTION OR IMPROVEMENT OF IMPLEMENTS OF HUSBANDRY.

To the person who shall invent or improve any Instrument or Machine applicable to Husbandry or Rural Economy (other than those above referred to), and which, from its utility in saving labour or expense, simplicity, or cheapness of construction, or other circumstances, shall be deemed by the Society deserving of public notice—The Silver Medal, or such sum in Money as the communication shall appear to deserve.

The account of the implement must be accompanied by a model made, when convenient, to a scale of three inches to the foot, to be deposited in the Society's Museum. The model to be formed of wood or metal; and the notice or description transmitted with it must specify, according to the best of the inventor's abilities, the purpose or advantage of his invention or improvement.

CLASS II.

ESSAYS AND REPORTS ON VARIOUS SUBJECTS.

I. GEOLOGICAL SURVEYS.

Fifty Sovereigns, or a Piece of Plate of that value, will be given to any person who shall, from actual observation, execute the best Geological Survey of any County or District in Scotland (except Berwickshire, the Lower District of Morayshire, Renfrewshire, the North of Ayrshire, and the Middle or Lower part of Perthshire, already Reported).

The Author must, to compete for this Premium, himself draw up a written Report or Essay on the Rocks and Soils of the District, and colour Geologically, in the fullest detail that the scale will admit of, a portion of Thomson's Atlas of Scotland (folio edition), corresponding to an extent of surface of not less than

200 square miles, and at the same time send a collection of specimens of Rocks to illustrate both the Essay and the Map—all which must be lodged with the Secretary on or before the 20th of October in any year.

This Report must give a full description of the Geology and Mineralogy of the district represented, accompanied by coloured sections of such portions of it as may appear to require this species of illustration, founded on actual observation—if in any case the sections should be ideal, it must be so stated. In this Report, the Author will be required to explain the classification and subdivision of the different rock formations he may have adopted, and, in general, to communicate every thing of interest or importance that may occur to him as being connected with the subject of the survey. He will likewise be expected to have paid particular attention to the topography of the county or district included in the survey, so as to be able to point out any errors or omissions he may have detected in the Map; or should he be able to procure a better survey of the district he is describing than that which is in the collection above referred to, he will be permitted to avail himself of it, provided it is on a scale equally suited to the purpose.

The author is farther invited to direct his attention to the soils of the district, so as to describe the ingredients of which they are composed, and whether they have been formed by the disintegration of the subjacent rocks, or have been transported from distant parts. Where the soil has been brought from a distance, the authors will state the quarters from which it appears to have been brought, as well as the boulders that occur in the soil, or are strewed over the district. It is necessary, also, that the author should shew the connection between the agriculture of the district and its rocks and soils, in reference to their influence on the pastures, crops, and timber of the district. Authors, in describing the country, must also notice any remarkable or interesting spring waters, particularly in respect to their temperature, and to the medicinal or other properties they may appear to possess. If not already sufficiently known, a chemical analysis of such waters as may be considered likely to be of importance must accompany the Report. The Report, Map, Sections, and Specimens of the different rocks referred to in the Report are, in the event of the author being found entitled to a Premium, to be the property of the Society.

Farther, for Geological Surveys deemed worthy of distinction, but which may not be found entitled to the principal Premium

in the year in which they are lodged, the Society's Gold or Silver Medal will be awarded to the authors. And, in order to hold out every encouragement to Geologists to assist the Society in the important object of completing Geological Surveys of the various districts of Scotland, it has been resolved, that should any survey not obtain a premium in the year in which it is transmitted, the author shall be entitled to amend it by farther observation, and to bring it forward for competition in a future year.

The Surveys in competition for this premium in 1838, to be lodged on or before the 20th of October next, under the conditions on pages 5 and 6.

NOTE.—Two Hundred Square Miles being the smallest extent for which the above Premium of Fifty Sovereigns is, under any circumstances, to be awarded, will only be considered sufficient in cases in which the Competitors shall have selected for the subjects of their Surveys and Reports, those districts which, from the variety or the complexity of the geological formations, and the importance of the mineral resources they contain, possess the greatest degree of public interest, and, at the same time, require the most time, labour, and talent, to describe with the minuteness and accuracy expected.

It must, therefore, be distinctly understood, that the Maps and descriptions of less interesting parts of the country in which a more uniform geological structure, and a greater sameness of mineral character, are found to prevail, will not be entitled to that premium, unless they shall comprehend such an increase in the number of square miles beyond the minimum extent above specified, as the Directors may judge to be fairly proportioned to the circumstances of the case in these respects, and to the comparative facility with which the work may consequently appear to have been performed.

2. REPORTS ON COAL DISTRICTS.

Thirty Sovereigns, or a Piece of Plate of that value, will be given for the best Geological and Mineralogical Report upon any Coal District in Scotland, with the exception of those situated in the south-east part of the County of Fife, and the north of Lanarkshire, which have already been reported upon.

In these Reports it is expected, that besides a general description of the district, the principal shaft sections, shewing the regular order of superposition and succession, as well as the thickness of the different strata, together with their lines of bearing, the direction and degree of their dip, and their organic contents, shall be carefully noticed and accurately detailed. The occurrence of slips, faults, or other disturbances, their direction, and the effects occasioned by them on the adjacent strata, must also

be particularly noticed, specifying in what manner they appear to have been caused. The author must also particularly describe the trap-rocks, if any exist, in the coal-field, and specify their nature, situation, and extent. He will also state whether they intersect the other strata in the form of dykes, or in what other way they occur; and in each case he will describe what effect has been produced by them on the contiguous sedimentary strata. Limestone, iron, or any other profitable mineral or metallic substances in the district, must likewise be specially noticed.

Each report must be accompanied by a general map or plan of the district, and coloured sections taken through such parts of it as may best serve to illustrate the above details, and also by specimens of the most remarkable varieties of organic remains, such as shells, vegetables, teeth, scales, bones, &c., all which are, in the event of the author being found entitled to a premium, to be the property of the Society.

The varieties of coal occurring in the district must be mentioned, as well as the price of each variety at the pit mouth. The use ~~to~~ which each variety of coal is generally applied, must also be

It will enhance the value of the Essays, in the opinion of the Society, if they contain a statement as to the probable quantity of coal remaining in the district unworked, together with the data on which that statement rests. It would be desirable, also, if information could be given generally as to the number of pits where coal is worked in the district, and as to the quantity of coal (stated in tons) which, during each of the preceding three years, has been raised in it, the number of steam-engines, of colliers, and horses, employed to raise the same. Authors are invited also to direct their attention to the moral and social condition of the persons employed in the collieries.

Reports of the present year's competition to be lodged on or before the 20th of October next, under the conditions on pages 5 and 6.

No Report will be entitled to this premium unless the whole of the above conditions shall have been strictly fulfilled, and its merits will be estimated with reference to the amount and value of information given rather than to the extent of country described.

The Society's Gold or Silver Medal will be given, according to their value and extent, for such Reports on Coal Districts as may be found worthy of that distinction, but which may not be consi-

dered to be entitled to the principal premium, provided they are lodged with the Secretary by the time specified.

NOTE.—The Society takes this opportunity of pointing out to the Proprietors and Managers, and other individuals employed in Coal-Works, how much they have it in their power to contribute to the advancement of science, by noticing and preserving the organic remains that have been, or may be, found in the coal-fields with which they are respectively concerned. The fossil remains of plants, shells, crustacea, and fishes, are most commonly met with in limestone, slate-clay, bituminous shale or blaes, and in the nodules and bands of ironstone; but it is earnestly recommended that the miners should be directed to lay aside, and to preserve as entire as possible, every extraneous substance of unusual form and appearance, which they may find in any of the beds in which they are working.

The Society will at all times most thankfully receive communications on this subject, accompanied by specimens, and will confer Honorary Premiums upon those individuals who may most distinguish themselves by their intelligence, zeal, and diligence, in bringing important and interesting discoveries of this nature to its notice.

3. MINES AND MINERALS.

The Gold Medal, or a Piece of Plate of such value as the communication may be adjudged to deserve, will be given for the most satisfactory Report describing all the useful Metals or Minerals which might be profitably worked, and which are not now worked, in any particular district in Scotland, with the exception of Lismore, Appin, and Ardchattan, already reported. The district reported on must not be less than fifty square miles. The Reports must be accompanied with specimens of the Metals or Minerals described; and these must, for the present year's competition, be lodged on or before the 20th October next, under the conditions on pages 5 and 6, and remain the property of the Society, in the event of a premium being awarded to the Reporter.

4. CONTENTS OF PEAT MOSSES.

The Honorary Gold or Silver Medal, according to the value of the communication, will be given to the person who shall transmit to the Society in any year the most satisfactory Account of the Remains, Animal, Vegetable, or Mineral, found in any Peat Moss in Scotland, including an account of any Works of Art found, and the depth at which they were imbedded; with a description of the extent of the Moss, its depth, and general qualities, its geographical and topographical position, and height above the level of the sea. Specimens of the bones, nuts, cones, wood, leaves, adipocire, boulders, or other matters found in the moss, should, if practicable,

accompany the account, to be the property of the Society in the event of a premium being awarded for the communication. At all events, the organic remains should be correctly described or figured, reference being at the same time made to the museum or collection in which they happen to be deposited. The condition, size, and kind of the timber found imbedded in the moss should be specified, and the direction in which the trees are deposited. The author will also be expected to describe the probable origin or formation of the moss, its component parts, and the subsoil on which it rests.

Essays for this year's competition to be lodged on or before 20th October next, under the conditions on pages 5 and 6.

5. PRODUCTS OF PEAT MOSS.

The Gold Medal will be given for the best and approved account of the uses to which Bog or Peat Moss may be beneficially applied, and especially as to the extracting of Tar from Peat, and its application to the smearing of Sheep and other purposes, to which foreign Wood Tar is now applied.

It is expected that the Competitors shall detail the experiments on which their Reports are founded, and shall add such observations as may occur on the making of carburetted hydrogen or inflammable gas for illumination, and on the production of pyroligneous acid, or other products, from Peat. Reports to be lodged on or before 20th October 1838, under the conditions on pages 5 and 6.

6. POINT IN CATTLE OF THE WEST HIGHLAND BREED INDICATIVE OF DISPOSITION TO FATTEN.

It having been represented, as the result of careful observation of Cattle of the West Highland breed, that when the distance from the hough to the hoof is short, and consequently the length from the hip to the hough is relatively long, the animal having such a point is to be preferred to one that has a longer foot and a shorter leg, the Society, desirous that this very prominent point should be established, supposing the observation already made to be correct, offers the following Premium :—

The Gold Medal, or a Piece of Plate of such value as the Directors may think adequate, will be given to the person who shall have selected not fewer than six Oxen of the West Highland breed, under similar circumstances, three with short, and three with long feet, and fed them nearly in the same manner, and shall exhibit them, after having been so fed, at the Society's General Show of Live Stock at Glasgow in 1838.

Should any prominent configuration of any part be ascertained to indicate a constitution disposed to fatten, the choice of stock, and the selection of calves for rearing will be greatly facilitated.

It may be observed, that many animals, as the ox, anatomically speaking, walk on their toes; hence from the hough to the hoof is equivalent to the foot in animals which rest on their heels.

7. PRESERVING POTATOES.

Ten Sovereigns, or a Piece of Plate of that value, will be given for the best and approved Account, founded on experience, of the most successful method of Preserving Potatoes in good condition, in their natural state, for a period of not less than ten months from the time of their being taken up.

Competitors are required to communicate their experience as to the superiority of any of the methods now in practice, viz. securing the Potatoes in covered heaps upon the surface, in pits, in houses, vaults, cellars, or otherwise.

Very opposite opinions seem to be held on the advantages of pitting or storing in out-houses or cellars, and also as to the general temperature which should be aimed at, some recommending from 35° to 40°, and others from 50° to 60° Fahr. Where pitting is preferred, there appears to be a difference of opinion as to the proper depth of the pits, and as to the thickness of the covering; likewise, whether the heap should be kept in a dry or damp state generally, and as to the utility of placing either a layer of dry straw or dry fern, or of green sprats or fresh turf, between the potatoes and the earthy covering, or of employing no other covering than the dry soil. Competitors are required to state their views on all these topics, and also as to what extent the preserving character of potatoes depends on innate qualities in the tubers, or in the mode of preservation employed; and it is desirable that the names and descriptions of the different varieties of the potato that appear better adapted than others for long keeping, should be mentioned.

Reports to be lodged with the Secretary, on or before the 20th October 1838, under the conditions on pages 5 and 6.

8. DOMESTIC DYES.

For the best and approved Essay on Domestic Dyeing, containing the receipts employed for Dyeing in various parts of Scotland and its Islands, and in which native plants form the principal ingredients—Ten Sovereigns, or a Piece of Plate of that value.

The Essay must give a description of the cloth or stuff to which each process is applicable, the colour which each receipt produces, and its durability. A particular account of the substances employed for fixing the colours, and of the mode in which they are prepared, will also be required. Small pieces of the dyed stuffs, and dried specimens of the bark and of the plants used, whether shrubby, herbaceous, or of the lichen tribe, must accompany the Essay, which must be lodged on or before the 20th October 1838, under the conditions on pages 5 and 6.

9. EFFECTS OF WOODS ON CLIMATE.

For the best Essay on the Effects of Woods on Climate, and shewing how far the climate and productiveness of a district have been or may be improved or altered by extensive plantations—A Gold Medal.

In the Essays to be given in for this premium, it is wished that the general principles advocated should, as far as possible, be supported by facts ; and, in particular, it is requested that reference be made to districts formerly bare of wood, which have ~~been~~ extensively and judiciously planted within the last thirty or forty years, and to the effect thereby produced on the climate, as well as on the productiveness of the district. It is also desired that regard be had to the comparative advantages and disadvantages in this respect of planting in masses, strips, clumps, and hedge-rows, and the local situations proper for each. Competitors will have in view how far the climate may have been modified or improved by other causes, such as drainage.

Essays to be lodged on or before the 20th October 1838, under the conditions on pages 5 and 6.

10. SUBSOIL AND TRENCH PLOUGHING.

For the best and most approved Report on Subsoil Ploughing and Trench Ploughing—The Gold Medal, or a Piece of Plate of the same value.

The Reporter is required to state the different soils to which such modes of ploughing are respectively applicable, and, in reference to the various kinds of land, which of the subsoil and trench ploughs he most approves, the mode of operation, the depth to which the ploughs should penetrate in the respective subsoils, estimating the relative expenses of the labour, the season of the year when the work should be executed, whether thin clay or moor-lands with a retentive subsoil, are improved by deep under-ploughing without the previous expensive operation of fre-

quent drainage, and what soils are not ameliorated by deep trench ploughing; also such further information as may suggest itself to the Reporter, carefully distinguishing, throughout his paper, practical results from theoretical opinions.

It is particularly wished that a clear distinction shall be preserved between the use of the words Trench-Ploughing and Subsoil Ploughing, the former, or trench-ploughing, being used where the whole soil is ploughed, and the latter, or subsoil-ploughing, being used when the subsoil is stirred but not ploughed.

Reports to be lodged on or before the 20th of October 1838, under the conditions on pages 5 & 6.

11. COMPARISON BETWEEN DIFFERENT KINDS OF MANURE IN RAISING POTATOES.

It having been stated as the result of certain experiments communicated to the Society, that the Street Manure of Edinburgh is inferior about 30 per cent., or as 44 bolls are to 64 in raising Potatoes, to that obtained from Stables and Dairies, while it is nearly equally efficient in producing Turnips and some other descriptions of crop, the Society is desirous that the cause of this difference should be investigated, with the view of throwing additional light on the elements which enter into the composition of different descriptions of Vegetables; and deeming that the statement above made affords a good opportunity for prosecuting this inquiry, offers the following premium:—

Twenty Sovereigns, or a Piece of Plate of that value, will be given to the person who shall furnish the best and most approved explanation (founded on chemical analysis of at least the three descriptions of Manure mentioned) of the cause of the inferiority of Street, or what in Edinburgh is commonly called “Police Manure,” in the production of Potatoes, as compared with that obtained from stables and cow-houses.

It is expected that Competitors will furnish a statement of the nature and constitution of each description of Manure subjected to analysis, with such other facts as they may deem essential for promoting the object the Society has in view in offering this Premium. The Society begs to call the attention of Competitors to a paper on this subject by Mr Oliver, which will appear in the Society’s Transactions in the number of the Quarterly Journal of Agriculture for June next. Reports to be lodged on or before 20th October 1838, under the conditions on pages 5 and 6.

12. DISEASE IN THE SILVER FIR.

The Honorary Silver Medal will be given for the best account of the disease which has of late years attacked the stems, larger branches, and occasionally the twigs of the Silver Fir (*Abies picea*), somewhat resembling the well-known affection of the Larch; with suggestions founded on experience, for checking the progress of the malady, or for preventing it.

It will be desirable that specimens of the diseased bark, and of both sexes of the insect which appears to occasion the evil, should accompany the Reports, which are to be lodged by 20th October 1838, under the conditions on pages 5 and 6.

13. EXTENDED APPLICATION OF WATER AND OTHER POWER TO FARM PURPOSES.

Twenty Sovereigns, or Plate of that value, will be given for the best and approved Essay on the Extended Application of Water and other Power to Farm Purposes.

The writer must enumerate the various subordinate purposes to which the power impelling thrashing machines may be applied, such as cutting turnips, chopping hay, &c., and describe the safest, simplest, and most economical way of connecting the first power with these subordinate machines. He must also point out how premises at present generally in use for thrashing machines may be most conveniently adapted to these other purposes, and what better arrangement could, with the same view, be made in the erection of new premises.

The writer is requested to state his opinion as to the best construction of the first power; that is to say, if steam be used, whether beam, crank, or any other kind of engine, and whether on the condensing or non-condensing principle; if water be used, whether overshot, undershot, or breast wheel, and so on with respect to other powers. The writer must accompany his Essay with Explanatory Drawings and Estimates, to shew that his plans will not be attended with any considerable outlay or expense.

Reports to be lodged by 20th October 1838, under the conditions on pages 5 and 6.

14. COMPARATIVE EFFICIENCY OF TWO METHODS OF THOROUGH DRAINING.

It having been represented to the Society, as the result of extensive experience and observation, that the modern system of

thorough draining is more efficient when the drains are cut in the direction of the natural slope or declivity of the ground, than when cut at right angles, or nearly at right angles, to the natural slope, as has been frequently practised, the Society, desirous of ascertaining if this representation is correct, and to obtain the scientific explanation of the fact, offers the following premium:—

Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best and approved Account of the effects of the two methods of Cutting Drains above described, the depth of the Drains, and the distance between them being in both cases the same, with such explanation of the cause of the greater or less efficiency of either mode as the Competitor may deem most satisfactory.

Reports to be lodged by 20th October 1839, under the conditions on pages 5 and 6.

15. REPORTS ON IRRIGATION.

Ten Sovereigns, or a Piece of Plate of that value, will be given for the best and approved account of the Management of Water Meadows, founded on actual experiment, within three years preceding the date of the Essay.

The experiments to be made on not less than five acres, whether detached or otherwise, and a description to be given of the rills or streams employed, and of the quality of the water, and of the manner of collecting and applying it; also an account of the land prior to the introduction of irrigation upon it, and of its estimated value at that period, and at the time when the Report is made; certified statements to be made of the quality of grass, if any, cut green in the spring, and the quantity and quality of the hay and aftermath produced upon the portion reported on, and the kind of stock, if any, which has been allowed to depasture it.

The Essays, accompanied by a specimen of the hay produced that season, to be lodged on or before 20th October 1839, under the conditions on pages 5 and 6.

16. FOREST PLANTING.

For the best and approved Essay on Forest Planting, founded on personal observation and experience, or on known practical results, a premium of Twenty Sovereigns, or a Piece of Plate of that value.

The Essay will be expected to include an account of the different soils, exposures, and declinations, best suited for growing the

various kinds of Forest Trees, with remarks on the climate of different districts of Scotland, correct lists of the various genera, species, and varieties of Trees best adapted for particular situations, and the proportional number of each species which should be planted on a given space; an account of the comparative value of the different kinds of Trees, shewing the purposes for which the respective sorts are more applicable in affording wood for plough-wrights, and for general country purposes, for joists, deals, carpentry, or naval timber, &c., or useful bark; the influence of the different sorts of Trees on the pastures below them, or in their immediate vicinity; notices of the insects and diseases which affect Forest Trees, with suggestions for their prevention or removal; together with remarks on the comparative advantages of the promiscuous planting of different kinds of Trees, or of grouping masses of the same species together, both in an economical and ornamental point of view.

Essays to be lodged on or before 20th October 1839, under the conditions on pages 5 and 6.

17. SHEEP PASTURES AT HIGH ELEVATIONS.

For the most satisfactory account of the Plants constituting the Herbage on very elevated and mountainous Sheep Pastures in Scotland, where Wedders are believed to thrive and to fatten so as to afford the finest mutton, and a similar account of the Plants constituting the old Pastures at the bases of mountains, understood to be favourable for Milch Cows, and adapted for the fattening of Cattle—A Gold Medal, or a Piece of Plate of its value, in the option of the Competitor.

Some of the most elevated Sheep Pastures in Scotland, from 2000 to 3000 feet above the level of the sea, are considered by many sheep farmers to afford most nutritious herbage for feeding and fattening of prime wedders; such are those on the side of Ben-vorlich, on the south-west of Strathconnan, on the high hills of Kintail, and on Benlawers in Perthshire. Various kinds of musci and lichens, and other plants, are intermixed with the alpine grasses at those heights. It is required that the botanical and common names of all the plants, phænogamous and cryptogamous, constituting the pasturage, should be given, and that their proportional abundance should be specified as nearly as can be guessed. Dried specimens of the plants will also be required, with their names attached. Botanists visiting those lofty districts may learn from the more intelligent and observ-

ing shepherds their opinions as to the nutritive qualities of the plants, or at least of particular districts of pasturage where certain plants chiefly abound; and minute inquiry should be made as to the kinds of mosses and lichens observed to be most readily or greedily cropped by the sheep. The occurrence of sea-shore plants (belonging, for example, to the genera *Statice* and *Plantago*), on these elevated stations should be adverted to, salt herbage being accounted both nutritious and fattening.

It has been remarked, that old pastures near the bases of mountains, which always contain among the gramineous plants an intermixture of various musci, afford excellent food for milch cows, the milk proving both plentiful and rich; and that such old mossy pastures are said to fatten cattle more readily than recent artificial pastures. The musci in these should be examined and compared as to their qualities with those found on the more elevated sheep walks, and specimens should also be transmitted.

To be lodged on or before the 20th October 1839, under the conditions on pages 5 and 6.

18. IMPROVED SHEEP SALVE.

A Premium of Twenty Sovereigns, or Plate of that value, will be given to the person who, on or before the 20th October 1839, shall lodge with the Society a specimen of a substance which can be economically employed for Smearing Sheep, with a view to secure the health and comfort of the animal, without deteriorating the value of the fleece or carcass, and which shall have been proved by at least two successive years' use on the same stock, not under 20 scores—one-fourth of the animals upon which the experiment is repeated, being the same as those upon which it was formerly tried.

The Society understands that of late years a variety of new substances have been tried, which have either entirely or partially failed, and the wool growers, especially in the Highland districts, have been obliged to resort to the former plan of using tar and grease, believing from experience that no other known substance sufficiently protects the animal from cold and wet.

The great objection to tar is, that the value of the wool smeared with it is very much lowered, from the manufacturer being unable to render it sufficiently white to dye it any bright colour. The Society is therefore anxious to procure a substance which will obviate this disadvantage, at the same time that the health and condition of the stock on which it is used may be completely preserved.

The Essays, with specimens of the Salve and of the Wool, and a note of the price obtained for the latter, to be lodged by 20th October 1839, under the conditions on pages 5 and 6.

19. CULTIVATION OF THE RECENTLY INTRODUCED CEREAL AND OTHER GRAINS.

Ten Sovereigns, or Plate of that value, will be given to the cultivator in any district of Scotland, who shall submit the most perfect and approved Report, founded on actual experiments made for the purpose of ascertaining the comparative merits in cultivation of the different varieties of Grain, including wheat, barley, oats, beans, and pease, recently introduced, or not generally known in the district, the quantity of each variety sown not being under one imperial bushel.

The Reporter is required to state his opinion regarding the merits or demerits of the newer varieties, as compared with those generally grown in the district,—taking into consideration the quality as well as the quantity of the produce; he will further advert to the nature of the soil, expense, and altitude above the level of the sea, where his experiments may have been conducted; and will state his opinion as to what varieties are likely to succeed better or worse on soils, &c., differing from his own; giving, at the same time, as far as he can ascertain, the origin and history of the different varieties; and transmitting samples along with his Essay.

Information regarding varieties which Competitors may have been enabled to grow only in smaller quantities, will be considered an acquisition.

Reports to be lodged on or before 20th October 1839, under the conditions on pages 5 and 6.

20. FEEDING OF FARM-HORSES ON RAW AND ON PREPARED FOOD.

It having been represented to the Society, as the result of careful observation, that Farm Horses fatten faster, though doing the same work, when fed with a given quantity of boiled corn, than when the same quantity is given to them in a raw state, the Society, desirous that this point, which accords with some recent scientific discoveries, should be further investigated, offers the following premium:—

Twenty Sovereigns, or a Piece of Plate of that value, will be given to the person who shall furnish the best and approved account of an experiment or experiments shewing how far the above

statement is well founded. Competitors will be allowed to make the experiments with any of the usually cultivated descriptions of grain, such as wheat, barley, oats, beans, or pease; and it is desirable that the accounts furnished should embrace as great a variety of these grains as possible.

Reports to be lodged by 20th October 1839, under the conditions on pages 5 and 6.

21. EARLY REARING AND FATTENING OF LAMBS.

Ten Sovereigns, or Plate of that value, will be given for the best and approved account, founded on practical experience in Scotland, of the rearing and fattening of lambs of any breed, pure or cross, for table or market, by the term of Christmas.

Competitors are required to state the entire management of the ewes during the previous season, and of the lambs till disposed of; the expense attending their treatment, and how far the practice is likely to prove remunerative, taking into view the average state of the seasons, and prices in the market; the nature and cost of erections requisite for their protection or shelter; the results of management in former years, should the party have practised the same, and such other particulars as may appear deserving of notice.

Reports to be lodged on or before 20th October 1839, under the conditions on pages 5 and 6.

22. INSECTS INJURIOUS TO AGRICULTURAL PLANTS.

Ten Sovereigns, or Plate of that value, will be given for the best and approved account of Insects injurious to Agricultural Plants.

Reports to be lodged on or before the 20th of October 1839, under the conditions similar to those specified for No. 23.

23. INSECTS INJURIOUS TO FOREST TREES.

Ten Sovereigns, or Plate of that value, will be given for the best and approved account of Insects injurious to Forest Trees, especially the Larch and the various species of Pine.

Reports to be lodged on or before the 20th of October 1840, under the conditions on pages 5 and 6.

It is required that the Essays for the Premiums Nos. 22 and 23 be the result of personal observation; specimens of each insect, in its various stages, to be transmitted along with the Report,—the nature and extent of the damage caused by the insects to be explained,—and the most effectual remedies which have been employed for preventing or checking their ravages, to be described; and further, a distinct account to be given of the nature and

condition, exposure and altitude above the sea, of the ground on which the plants or trees reported on were grown.

NOTE.—Accounts, by scientific entomologists, of noxious insects infesting the timber, bark or foliage of trees, with suggestions for obviating their ravages, will be very acceptable to the Society, and Honorary Premiums will be awarded to the authors of such communications, according to circumstances.

24. COMPARATIVE NUTRITIVE PROPERTIES OF GRASSES.

Twenty Sovereigns, or Plate of that value, will be given to the Proprietor or Tenant in Scotland, who shall, on or before the 20th October 1840, transmit to the Society a satisfactory Report of experiments made to ascertain the comparative nutritious qualities of the ordinary Grasses at different ages, on the same quality of soil, and managed in the same manner.

The experiments to be made by the feeding of milch cows on pastures of different ages sown down in the same manner, and the same cows may be pastured on the different fields of grass by alternate weeks or other equal periods, and the comparative produce ascertained by the quantity and quality of the milk produced. It is required that the quality of the soil shall be described, and the ages and kinds of Grasses of which the pastures consist, and that the breed of cattle and other particulars necessary to bring out a satisfactory result, shall be given. Competitors are referred to the conditions on pages 5 and 6.

25. EXTIRPATING FERNS FROM PASTURES.

Fifteen Sovereigns, or a Piece of Plate of that value, will be given for the best and approved account, founded on experience, of a cheap mode of eradicating Ferns from Pastures, and particularly from hill pastures, where the plough cannot be employed.

The extent of ground subjected to the experiment must not be less than twenty acres; the Report must state what proportion of the surface was occupied by the ferns, with the expense per acre incurred in their eradication, and must be lodged with the Secretary, accompanied by specimens of the ferns destroyed, on or before the 20th October 1840, under the conditions on pages 5 and 6.

There is evidence in favour of the belief that the object in view may be accomplished by repeated irrigation of the ground; also, that repeated cutting of the ferns while young and succulent, thus preventing their bringing their tops to perfection during the whole season, or two consecutive years, will destroy them. It is desirable that the truth of these opinions should be established or refuted, and any other successful mode of treatment pointed out.

26. REPORTS ON IMPROVED RURAL ECONOMY ABROAD.

The Honorary Gold or Silver Medal of the Society, according to the value of the communication, will be given for approved accounts, founded on personal observation, of any useful practice or practices in Rural or Domestic Economy adopted in other countries, which may seem fitted for being introduced with advantage into Great Britain.

However advanced the state of the Useful Arts may be considered in this kingdom, it is not to be doubted that there are many practices in use, both of Domestic and Rural Economy, in other countries, and particularly in France, the Low Countries, and the North of Germany, highly deserving of attention or imitation, and which yet are too apt to be disregarded or unnoticed by the traveller or casual resident. The purpose chiefly contemplated by the offer of the present premium, is to induce gentlemen, who may visit other countries, to take notice of and record such particular practices as may seem calculated to benefit their own country in the branches of the arts referred to; and it is proposed that the earliest opportunity shall, in all cases, be taken of communicating such details to the public.

27. HONORARY PREMIUM FOR REPORTS ON CERTAIN DISTRICTS IN SCOTLAND.

To the person who shall, on or before the 20th October in any year, furnish to the Society the best account of a District in Scotland, remarkable for any striking improvements that have been lately effected in it, whether with reference to its Husbandry, or to the establishment of useful Manufactories, of Fisheries, or of additional facilities for external or internal communications, such as Harbours, Railroads, or other means of public conveyance, including the state and management of Public Roads, and generally of such other improvements as have a direct tendency to increase the physical resources of the district—The Society's Gold or Silver Medal, or a Piece of Plate, as the Directors may see fit in the circumstances of the case.

The Report is expected to be given from the writer's experience or observation, and the extent of the district reported upon is not to be less than fifty square miles.

In describing the present state of Husbandry, authors are required to advert to the general character of the surface in regard to its being rocky, or consisting of soil; and in describing the latter, they must state by what means it appears to have been formed, whether by disintegration of the subjacent or adjoining strata,

or by transportation from other localities. The authors must also mention, and describe generally, the kind of trees which appear to thrive best within the district, and they must state whether, and what different kinds shew the most rapid and vigorous growth on the several descriptions of soil. They must also give an account of the prevailing native plants on uncultivated situations. Some account must likewise be given of the improvements made or in progress in the methods of tillage, the breeds of stock, the modes of cropping, the progress and methods of drainage, and the like. They will also give a particular account of any advantageous modes of managing estates and conducting their improvement, which may have been adopted by proprietors or their agents in the district.

In reference to the offer of the Premium, which is alternately made for *Manufacturing Improvements* in a district, authors must, in describing these, not only state the nature of the commodity or article manufactured, but also the nature of the machinery, and other means by which the manufactory is carried on; the number of persons of different sexes and ages employed, the value of the manufactory, the markets to which the articles manufactured are sent, the nature of the raw materials, and the source or sources whence they are respectively derived.

Authors, in treating of either kind of improvements, according as their knowledge and experience may best enable them, are required particularly to state the effects which have been thereby produced, not merely in respect of the annual revenue thence accruing, but also on the moral, social, and physical condition of the inhabitants. The authors should, in their accounts, mention the elevation of the principal points of the district above the sea. They are likewise invited to offer suggestions for the future improvement of the district, whether physically or morally.

It is further expected that authors, if the district they undertake to give an account of happens to have been already described in any well-known publication, will avoid repeating the information which may be found there, and merely refer to such publication.

28. INVESTIGATION OF CERTAIN POINTS CONNECTED WITH THE SCIENCE OF AGRICULTURE.

The Society being desirous of encouraging inquiries, and obtaining information on every subject connected with Agriculture, and being aware, at the same time, how little is known with regard to some of the fundamental principles of Agriculture, hereby an-

nounce, that they will receive with favour, and reward liberally, Essays or Memoirs on any of the following subjects; the precise amount of the Premiums to be fixed by the Directors according to their opinion of the merit and value of the respective Essays.

With a view to this important object, the Society have set apart Fifty Sovereigns annually, to be awarded for such approved communications as may be lodged on any of the subjects referred to. In the event of papers being communicated in any year which shall appear to merit a sum greater than the Directors have at their disposal, some of these papers will be directed to stand over to receive rewards in a future year.

1. An Essay or Memoir explaining, on scientific principles, the mode in which soil operates in producing or facilitating the germination and growth of Vegetables.

2. An Essay or Memoir describing and proving, on scientific principles, what is the best admixture of the ordinary elements of soil for promoting the germination and growth of particular vegetables.

3. An Essay or Memoir describing, on scientific principles, the mode in which lime operates in rendering the soil better adapted for the germination and growth of particular vegetables.

4. An Essay or Memoir explaining, on scientific principles, the effect of drainage in altering the constitution or qualities of the soil, and increasing its fertility.

5. An Essay or Memoir, shewing the nature of the atmospheric influences on soil, in promoting its fertility, including the modification of these influences arising from heat and cold, dryness and moisture.

NOTE.—It is expected, and is to be explicitly understood, that the authors of the above Essays will not offer mere speculative conjectures on the subjects treated of, and far less make a compilation of the opinions of others. They must be able to state that they have themselves studied and investigated the subject treated of. They must also explain the nature and the mode of inquiry adopted by them, and detail the experiments which they have instituted, from which their inferences have been derived. The Essays or Memoirs to be lodged by the 20th of October in any year, under the conditions on pages 5 and 6.

CONDITIONS OF COMPETITION FOR ESSAYS AND REPORTS.

The Conditions of Competition for Essays and Reports will be found under the "Notice to Candidates" on pages 5 and 6, and to which Competitors are particularly referred.

The specimens of Mines, Quarries, &c. may be lodged at the Society's Hall at any period. The Essays and Reports on subjects 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13, are to be lodged on or before the 20th October next 1838; those on subjects 14, 15, 16, 17, 18, 19, 20, 21, and 22, by 20th October 1839; those on subjects 23, 24, and 25, by 20th October 1840; and Reports on subjects 26, 27, and 28, by the 20th October in any year.

CLASS III.

WASTE LANDS.

1. IMPROVEMENT OF A SPECIFIED EXTENT OF LAND BY TILLAGE.

To the Proprietor or Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society a satisfactory Report of having successfully improved and brought into profitable tillage, within a period of five years immediately preceding the date of his communication, the greatest extent of waste and hitherto uncultivated Land, not being less than one hundred acres—The Gold Medal.

To the Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society a satisfactory Report of having, within the period of three years preceding the date of his Report, successfully improved, and brought into profitable tillage, an extent of waste and hitherto uncultivated Land, not being less than thirty acres, on the same farm—The Honorary Silver Medal.

The Reports in competition for both premiums may comprehend ~~such~~ ^{and} general observations on the Improvement of Waste Lands as the ~~writer's~~ ^{writer's} experience may have led him to make; but they are required to refer especially to the land reclaimed (which, if not in one continuous tract, must be in fields of considerable extent), to the nature of the soil, the previous state and probable value of the ground, the obstacles opposed to its improvement, the mode of management adopted, the expense, and, in so far as can be ascertained, the produce and value of the subsequent crops; and the land must have borne one crop of grain, at least, previous to the year in which the report is made. The reports must be accompanied by a detailed statement of the expense, and by a certified measurement of the ground. Competitors for the more limited extent improved, will observe, that having gained the Silver Medal, it shall not afterwards be competent to include the same improvement in a subsequent claim for the Gold Medal. Competitors for both Premiums will attend to the general conditions, pages 5 and 6.

2. IMPROVEMENT OF A SPECIFIED EXTENT OF LAND FOR PASTURE.

To the Proprietor or Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society a satisfactory Report of having, within the period of five years immediately preceding the date of his communication, successfully improved an extent of waste and hitherto uncultivated Land, not

being less than one hundred acres, by draining, accompanied with irrigation or top-dressing with lime or other substances, or paring and burning the surface, and sowing grass seeds with or without a green crop—The Gold Medal.

To the Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society a satisfactory Report of having, within the period of three years preceding the date of his Report, successfully improved for pasture an extent, not being less than thirty acres on the same farm, of waste and hitherto uncultivated land, in the manner indicated in reference to the immediately preceding Premium—The Honorary Silver Medal.

The Reports are required to advert to all the particulars specified in the Conditions in the Premiums for the improvement by tillage, so far as these are applicable to the improvement of land for pasture; and the land must have been hayed or pastured three years at least previous to the year in which the Reports are made. The Reports must be accompanied by a detailed statement of the expense, and by a certified measurement of the ground. Competitors for the more limited extent will observe, that, having gained the Silver Medal, it shall not afterwards be competent to include the same improvement in a subsequent claim for the Gold Medal. Competitors for both Premiums will attend to the general conditions, pages 5 and 6.

3. RECLAIMING LAND FROM THE SEA.

To the Proprietor or Tenant in Scotland who shall, on or before the 20th of October 1838, transmit to the Society a satisfactory Report of his having, within the period of five years immediately preceding, reclaimed from the sea an extent of not less than five acres of land, or having converted into pasture an extent of not less than five acres of barren ground, periodically overflowed by the sea. The expense and mode of improvement to be accurately detailed, and the returns such as to hold out a reasonable prospect of remuneration—The Honorary Silver Medal, or a Piece of Plate, as in the opinion of the Directors the improvement may be held to deserve. Competitors will attend to the general conditions on pages 5 and 6.

4. RECLAIMING LAND BY EMBANKING RIVERS.

For the most satisfactory Report of the embankment of a river in Scotland, causing a profitable addition to or amelioration of the neighbouring lands, in consequence of securing them from the effects of inundations to which they have been previously subject

—The Silver Medal, or a Piece of Plate of such value as the communication may be adjudged to deserve. Competitors will particularly attend to noticing any effectual means which may have been adopted for preventing the inroads of moles or other vermin, into the embankment.

Reports to be lodged by 20th of October 1838, under the conditions on pages 5 and 6.

NOTE.—The Premiums Nos. 3 and 4 having been offered for some years, it is proposed to discontinue them, at least for some time, after 1838.

CLASS IV.

CROPS AND CULTURE.

1. NEW PLANTS ADAPTED TO FIELD CULTURE.

To the person who shall, on or before the 20th October in any year, report to the Society any new species or variety of useful Plant, adapted to the ordinary field culture of Scotland—The Silver Medal, or a Piece of Plate, as the Directors may see fit in the circumstances of the case.

Particular attention is directed to the raising or procuring of new varieties of Cereál Grains, as well as of the more useful herbage and forage plants; in the latter department a new variety of Italian Ryegrass, possessing the qualities of bulk of produce, permanency of duration, or other advantages calculated to render it superior to the common sort, will be considered an acquisition.

Satisfactory evidence will be required that the plant produced is new in the cultivation of the country, either as regards the species or variety, valuable as regards the uses to which it may be applied, and congenial to the soil and climate of Scotland. A particular detail of the discovery or circumstances which led to the experiment must be furnished, the mode of culture described, and a specimen of the plant transmitted; with such suggestions as to the probable value of its straw as experience may have enabled the competitor to afford.

2. SAVING HAY.

To the Farmer, Land-Steward, Overseer, or other person in the actual charge of a Farm, who shall in any one year have stacked not less than 500 Stones of Hay in the best condition, the produce of his own Farm, or of the farm of which he is in charge—The Silver Medal.

In order to draw the attention of practical Agriculturists to the Saving of Hay, and to the papers on the subject which have been published in the Society's Transactions, six honorary appropriate Silver Medals will be assigned for three years successively upon the applications first lodged, and in the order in which they are applied for, under the following conditions:—

A certificate must be lodged with the Secretary by any two Members, prior to the Summer Half-yearly General Meeting of the Society, that not fewer than three persons have agreed to compete in any district during that season for some one specific description of Hay, whether Clover and Rye-grass, Natural Grass, Watered Meadow, or Upland; and that the Competitors had agreed in naming a Judge to decide upon the quality of the Hay for which they intend to compete. The Judge to be so named shall inspect the Hay, and give his decision in writing betwixt the 10th and 30th of January following, and will award the Medal for the Hay of the best quality and in the best condition, if he shall be of opinion that any Competitor merits it. A report of the award, accompanied by an account, to be furnished by the successful Competitor, of the mode of treatment followed by him, and particularly of the time which elapsed betwixt the mowing and stacking, and whether the hay was put into tramp ricks or carried at once to the stack, shall be forthwith transmitted to the Secretary by the Members of the Society who signed the Certificate; and on the receipt of the report, the Secretary will forward the Medal to be delivered to the successful Competitor.

3. EARLY ANGUS OATS OF THE GREATEST WEIGHT.

The District of Strathspey, comprehending the Parishes of Cromdale and Inverallan, Abernethy, Kincardine, and Duthill, in the Counties of Moray and Inverness.

To the Tenant in the above district who shall have raised the heaviest early Angus Oats, not weighing less than 40 lb. per imperial bushel, upon any farm within the district, crop 1837—Seven Sovereigns.

To the Tenant who shall have raised the second heaviest early Angus Oats in said district as aforesaid—Three Sovereigns.

To the Tenant who shall have raised the third heaviest early Angus Oats in said district as aforesaid—Two Sovereigns.

The quantity raised by each competitor not to be less than fifteen imperial quarters, to be weighed between the 20th November

1837 and 20th March 1838; the weight to be the imperial standard.

Competitors are referred to the Advertisement of last year for information as to the other conditions and particulars to be attended to.

The certificates and declarations, with samples of the oats, not under half-a-pound, to be lodged at the Society's Hall on or before the 1st May 1838.

4. STRAW PLAIT.

1. To the person who shall grow and prepare in the best manner for Straw Plait in any District of Scotland, where premiums for the preparation and manufacture of that article have not already been awarded by the Society, the greatest quantity of Rye Straw, on not less than two acres—Ten Sovereigns, or a Piece of Plate of that value.

Competitors to lodge with the Society, on or before the 20th of October 1839, average samples of their prepared straw, accompanied by authenticated measurements of the ground upon which ~~the crop was raised~~, with statements explanatory of the management throughout, of the nature and value of the soil, and of the value of the produce.

It has been represented to the Society that rich or superior soils are unsuited to the growth of Rye Straw for Plait, and that waste sandy links and inferior light soils in low or early situations, such as are frequent along both sides of the Firth of Forth and other parts of the coast, are those on which its growth is most likely to prove profitable.

2. To the person who shall get plaited or manufactured, in any district of Scotland where premiums for this branch of industry have not been already awarded by the Society, the greatest quantity of Rye Straw, previous to the 20th of October 1839—Six Sovereigns.

To the person who shall get plaited or manufactured the second greatest quantity as aforesaid—Four Sovereigns.

Competitors to produce certificates by two Members of the Society, attesting the quantity manufactured, and transmit samples of the different kinds of plait made. They will also lodge an account of the expenditure and market value of the manufactured article, with information as to the class of persons employed, amount of their daily earnings, and such information generally as may be considered will forward the object in view, of encouraging the improvement of the female, juvenile, and

infirm portion of the labouring classes, by introducing habits of cleanliness and industry. Claims to be lodged by 20th October 1839.

5. PLOUGHING COMPETITIONS.

Premiums to Ploughmen for improvement in ploughing having for some years been given very generally over the country by the resident gentlemen and local Farming Societies, the Highland and Agricultural Society has, in the mean time, discontinued them; but being desirous of encouraging improvement in this branch of husbandry, the Society will give its Silver Plough-Medal to the Ploughman found to be the best at such competitions, provided not fewer than fifteen ploughs shall have started, and that premiums in money to an amount not less than three sovereigns shall have been awarded. The Medal will be issued upon a Report from one or more Members of the Society, who shall have actually attended the competition, stating the number of ploughs that had started, the number and amount of the money premiums awarded, and that the ploughman found to be the best had not received the Society's Medal at a previous competition in the same district.

The Report must be lodged with the Secretary, at the Society's Hall, within three months after the competition, otherwise the Medal will not be issued.

CLASS V.

PASTURES.

1. MANAGEMENT OF PASTURE LANDS.

The Gold Medal, or a Piece of Plate of the same value, will be given to the Proprietor or Tenant in Scotland who shall, on or before the 10th of November in any year, report to the Society the most successful Management of Pasture Lands, founded on practice.

The land, forming the subject of the Report, must have been pastured for at least three seasons, exclusive of that in which the Report is given in, and the extent of ground must not be under ten acres. If the land has been sown down within a period of eight years previous to that in which the Report is made, the reporter will be required, besides stating the mode adopted in laying down, and the kinds and quantities of seeds used, to give a correct detail of the management from the period of sowing until the land be sufficiently consolidated for the purpose of being

depastured. In any case, the reporter will be required to state the kind and quality of the soil, with its exposure and elevation, the mode of drainage, and the various proportions of grasses and other plants constituting the pasture; the means which have been employed in maintaining or increasing the productiveness of the herbage by top-dressing or otherwise; the description of stock grazed; and the modes which have been found most successful in practice of preventing or destroying the growth of plants injurious to the pasture.

Competitors are referred to the general conditions on pages 5 and 6.

CLASS VI.

LIVE-STOCK.—DISTRICT COMPETITIONS.

§ I. CATTLE.

PREMIUMS FOR IMPROVING THE BREED OF CATTLE IN THE
FOLLOWING DISTRICTS:

1. *The Islands of Islay, Jura, and Colonsay, in the county of Argyll.*
2. *The District of Argyll, and the parishes of North and South Knapdale, and the parish of Kilberry, north of the Isthmus of Tarbert, Argyllshire.*
3. *The Braemar District of Aberdeenshire, comprehending the parishes of Braemar, Crathie, Tullich, Glenmuick, and Glengairn, but excepting that part of Tullich situated in Cromar.*
4. *The Eastern District of Fifeshire, comprehending the parishes of Kilconquhar, Elie, St Monance, Pittenweem, Carnbee, East Anstruther, West Anstruther, Kilrenny, Craill, Kingsbarns, St Andrew's, Denino, Cameron, Leuchars, Newburn, Largo, Leven, Scoonie, Forgan, and Ferry-port on-Craig.*
5. *The Parishes of Inveravon, Kirkmichael, Morrlach, and Aberlour, in Banffshire, and Cabrach and Knochando, in Aberdeen and Moray shires.*
6. *The Counties of Moray and Nairn.*
7. *The District of Turriff, in the Counties of Aberdeen and Banff.*
8. *The County of Linkithgow.*
9. *The Districts of Eshdale and Liddesdale, in the Counties of Dumfries and Roxburgh.*
10. *The Islands of North and South Uist, Harris, Barra, and small Isles adjacent, in Inverness-shire.*
11. *The Districts of Breadalbane, Glenorchy, Glenlyon, Glenochy, Glendochart, Glenfalloch, and Rannoch, comprehending the*

parishes of Kenmore, Killin, Glenorchy, Fortingall, Dull, Weem, and Logierait, in the counties of Perth and Argyll.

12. *The District of Garioch, Aberdeenshire.*
13. *The Parishes of Glenisla, Lintrathan, Kirriemuir, Lochlee, Edzel, Lethnot, Cortachy, Clova, Airlie, Glamis, Forfar, Tannadice, Fearn, Ruthven, Kingoldrum, and Menmuir, in the county of Forfar.*
14. *The District of Formartin, in Aberdeenshire.*
15. *The County of Renfrew.*

For the best Bull, from two to seven years old, to be exhibited at the Competition in each of the six Districts, Nos. 1, 2, 3, 5, 10, and 11, as above described, and *bona fide* the property of a Proprietor, Factor, or Tenant, kept in his possession from the 20th day of May preceding the Competition—The Honorary Silver Medal.

For the best Bull, from two to seven years old, *bona fide* the property, and in possession, of any Tenant in each of the said six Districts, Nos. 1, 2, 3, 5, 10, and 11, kept on his farm within the District, from the 20th day of May preceding the Competition—Ten Sovereigns.

For the second best Bull, of the same age, in each of the said six Districts, the property, and in possession, of any Tenant, and kept on his farm within the District for the foresaid period—Five Sovereigns.

For the best two Queys, of three years old, the property of, and bred by, any Tenant in each of the five Districts, Nos. 1, 2, 3, 10, and 11, above described—Five Sovereigns.

For the second best two Queys, of three years old, the property of, and bred by, any Tenant in each of the said five last-mentioned Districts—Three Sovereigns.

For the best two Queys, of three years old, the property and in possession of any Tenant in the said District No. 5, above described, from the 20th day of May preceding the Competition, and which shall be kept by him within the District for at least one year after the award of the Premium—Five Sovereigns.

For the second best two Queys, of three years old, the property, and in possession, of any Tenant in the said last-mentioned District, to be kept as aforesaid—Three Sovereigns.

For the best Bull, from two to seven years old, *bona fide* the property, and in possession, of any Proprietor or Tenant in each of the nine Districts, Nos. 4, 6, 7, 8, 9, 12, 13, 14, and 15, as above

described, kept on his farm, within the District, from the 20th day of May preceding the day of Competition—Ten Sovereigns.

For the second best Bull, of the age above specified, *bona fide* the property, and in possession, of any Proprietor or Tenant in *each* of the said nine Districts, and kept on his farm, within the District, for the aforesaid period—Five Sovereigns.

For the best two Queys, of two years old, the property of, and bred by, any Tenant in *each* of the said nine Districts, Nos. 4, 6, 7, 8, 9, 12, 13, 14, and 15—Five Sovereigns.

For the second best two Queys, of two years old, the property of, and bred by, any Tenant in each of the said nine Districts—Three Sovereigns.

The competition in the Districts Nos. 1 to 8, both inclusive, will take place in 1838, and in Nos. 9, 10, 11, 12, 13, 14, and 15, in 1839.

The following Members of the Society (as Members only, or their Factors in their absence, can be named) are hereby appointed Committees for regulating all details at the Competition for the Eight Districts first above mentioned. In Districts Nos. 9, 10, 11, 12, 13, and 14, the Committees were named in the advertisement of 1837, and ~~the Committee for the District No. 15, will be intimated in that of 1839.~~

FOR THE FIRST DISTRICT.—Walter Frederick Campbell, Esq. of Islay, M.P.; Walter Campbell, Esq. of Sunderland; James Campbell, Esq. of Jura; Colin Campbell, Esq. Jura; Archibald Campbell, Esq.; Richard D. Campbell, Esq.; G. Todd Chiene, Esq.; Captain Alex. McNeill, younger of Colonsay; Duncan McNeill, Esq. advocate; Malcolm MacNeill, Esq. Lossit; and any other Members in the District; three a quorum.—Mr Campbell of Islay, in his absence Mr Campbell of Jura, and Mr Campbell of Sunderland, to be Conveners.

FOR THE SECOND DISTRICT.—The Duke of Argyll—Lord John Campbell—Sir Archibald Campbell of Succoth, Bart.—Sir John Poulett Orde of Kilmory, Bart.—Robert Bruce, Esq. Sheriff of Argyllshire—Alexander Campbell, Esq. of Ederline—Alexander Campbell, Esq. of Auchindarroch—James Campbell, Esq. of Jura—Colin Campbell, Esq. Jura—Duncan Campbell, Esq. of Ross—George Campbell, Esq. Succoth—James Archibald Campbell, Esq. of Inveraw—John Campbell, Esq. of Stonefield—Robert Campbell, Esq. of Sonachan—Alexander Campbell, Esq. of Monzie—Lieutenant-Colonel John Elphinstone—Colin Macdougall, Esq. of Lunga—Neill Malcolm, Esq. of Poltalloch—Lachlan

McNeil, Esq. of Driindrisaig—Dugald Sinclair, Esq. Kilchamaig—and any other Members in the District; three a quorum.—Sir John P. Orde, Bart., in his absence, Stonefield, to be Convener.

FOR THE THIRD DISTRICT.—The Marquis of Abercorn—the Earl of Aboyne—the Earl of Fife—the Honourable Captain William Gordon, M.P.—James Farquharson, Esq. of Invercauld—David Gordon, Esq. of Abergeldie—Michael Gordon, Esq. yr. of Abergeldie—John James Roy, Esq. Altdourie Cottage—Andrew Robertson, Esq. Crathie—and any other Members in the District; two a quorum.—Mr Farquharson of Invercauld, in his absence Mr Roy, to be Convener.

FOR THE FOURTH DISTRICT.—Lord William Robert Keith Douglas, of Denino—Sir Ralph Anstruther, of Balcaskie, Bart.—Sir David Erskine of Canbo, Bart.—Major Anderson of Kingask—Lieutenant-Colonel Briggs of Strathairly—Robert Bruce, Esq. of Kennet and Grangemuir—William Berry, Esq. of Tayfield—George Cheape, Esq. of Wellfield—H. Craigie, Esq. of Hallhill—General Durham of Largo—J. B. Fernie, Esq. of Kilmux—William Graham, Esq. of Greigston—Norman Hill, Esq. of Brownhills—Captain Kerr of Grange—Lieutenant-Colonel Lindsay, yr. of Balcarras—John Whyte Melville, Esq. of Mount Melville—David Monypenny, Esq. of Pitmilny—T. E. MacRitchie, Esq. of Craigton—R. Gillespie Smyth, Esq. of Gibleston—James Nairne, Esq. of Claremont—J. Home Rigg, Esq. of Morton—Archibald John Stewart, Esq. of St Fort—John Thomson, Esq. Craigie—Bethune J. Walker, Esq. of Fallfield—John Wood, Esq. Factor, Balcarras—James Wyld, Esq. of Gilston—and any other Members in the District; five a quorum.—Colonel Lindsay, and R. Bruce, Esq. of Kennet and Grangemuir, in their absence, Lieutenant-Colonel Briggs of Strathairly, to be Conveners.

FOR THE FIFTH DISTRICT.—The Earl of Fife—the Hon. Colonel Grant of Grant, M.P.—George Macpherson Grant, Esq. of Ballindalloch—John Macpherson Grant, Esq. yr. of Ballindalloch—William Grant, Esq. yr. of Elchies—Mr Grant Ruthven—Colonel Gordon, Inverlochy, C.B.—Arthur Thomas Gregory, Esq. of Buchromb—Major Stewart, Pityvaich—Mr Macinnes, Dandaleith, and Mr Skinner, Drumlin; three a quorum.—Ballindalloch, in his absence, Mr Skinner, to be convener.

FOR THE SIXTH DISTRICT.—The Duke of Richmond—the Earl of Moray—the Earl of Cawdor—Lieutenant-General the Hon. Sir Alexander Duff—the Hon. Colonel Grant of Grant, M.P.—the

Hon. John Stuart—Sir A. Dunbar of Northfield, Bart.—Sir W. C. Gordon, of Altyre, Bart.—P. B. Ainslie, Esq.—Lieutenant-Colonel James Biander, of Pitgaveny—James Campbell Brodie, Esq. of Leithen—William Brodie, Esq. of Brodie—Alexander Brown, Esq. Secretary Morayshire Farmer Club—Peter Brown, Esq. Linkwood—Dr James Bayne—C. L. Cumming Bruce, Esq. of Roseile and Kinnaird, M.P.—William Macpherson Christie, Esq. Ballimore—Hugh Davidson, Esq. of Cantray—Richard W. Duff, Esq. of Orton—John Forsyth, Esq. Forres—Captain William Fraser, Brackla—Colonel Gordon, C.B.—Captain Gordon, Revack—F. W. Grant, Esq. younger of Grant—George Macpherson Grant, Esq. of Ballindalloch—J. Macpherson Grant, Esq. yr. of ditto—Robert Grant, Esq. of Kincorth—William Grant, Esq. yr. of Elchies—John M'Innes, Esq. Dandaleith—William M'Intosh, Esq. of Geddes—William M'Killigan, Esq. of Relugas—Major-General Rose of Holm—Graham Speirs, Esq. Sheriff of the County—William Alexander Stables, Esq. of Park—Francis Smyth, Esq. of Knockomie—Patrick Sellar, Esq. of Westfield—William Fraser Tytler, Esq. of Balnain—William Young, Esq. of Burghhead, and any other Members in the District; five a quorum.—Sir Archd. Dunbar and Robert Grant, Esq. of Kincorth, to be Conveners.

FOR THE SEVENTH DISTRICT—The Earl of Fife—Lieutenant-General the Hon. Sir Alexander Duff—Sir Robert Abercromby of Birkenbog, Bart.—James Allardes, Esq. Boyndsmill—Alexander Currie, Esq. Sheriff of Banffshire—John Duff Dingwall, Esq. of Brucklay—Garden Duff, Esq. of Hatton—James Grant Duff, Esq. of Eden—Thomas Abercromby Duff, Esq. of Haddo—Major P. Dunbar of Mountcoffer—Captain Ferguson of Pitfour, R.N.—John Taylor Gordon, Esq. of Nethermuir—William Gordon, Esq. of Fyvie—William Gordon, Esq. of Aberdour—Alexander Grant, Esq. of Carnousie—James Rose Innes, Esq. of Netherdale—Alexander Keith, Esq. Netherthird—George Leslie, Esq. of Rothie—H. George Leslie, Esq. of Denlugas—Harry Leith Lumsden, Esq. of Auchindoir—James W. Mackenzie, Esq. Pittrichie—George Garden Robinson, Esq. Banff—John Brodie Spottiswoode, Esq. of Muireisk—Alexander Stewart, Esq. of Laithers—George Campbell Smith, Esq. Banff—B. C. Urquhart, Esq. of Byth and Meldrum—Archd. Young, Esq. Banff—and any other Members in the District; five a quorum.—The Earl of Fife, in his absence, James Grant Duff, Esq. of Eden, Convener.

FOR THE EIGHTH DISTRICT—The Earl of Rosebery—the Earl of Hopetoun—Lord Dalmeny, M.P.—Sir Thomas Livingstone of Westquarter—Sir James Dalryell of Binns, and Sir William Baillie of Polkemmet, Barts.—Robert Bauchope, Esq. Kinneil—Gabriel Hamilton Dundas, Esq. of Duddingstone—David Falconer, Esq. of Carlowrie—George Falconer, Esq. yr. of ditto—W. D. Gillon, Esq. of Wallhouse, M.P.—John F. Hamilton, Esq. of Westport—James M. Hog, Esq. of Newliston—James Johnstone, Esq. of Straiton—James Learmonth, Esq. of Laurence Park—Captain John Macan of Lurgyvallen—James Macdonald, Esq. of Dalness, Sheriff-substitute of the County—Major Norman Shairp of Houston—John Stewart, Esq. of Binny—Peter Thomson, Esq. Hangingside—and any other Members in the District; three a quorum.—The Earl of Rosebery, in his absence, J. M. Hog, Esq. of Newliston, Convener.

FOR THE NINTH, TENTH, ELEVENTH, TWELFTH, THIRTEENTH, AND FOURTEENTH DISTRICTS—The Committees remain as last year, with the addition of those resident Members since elected.

FOR THE FIFTEENTH DISTRICT—Sir John Maxwell of Pollock, Bart., to be Convener of the Committee of resident Members.

RULES OF COMPETITION.

1. The Conveners, with the approbation of a quorum of the Committee for conducting the several Competitions, are respectively authorized, in such cases as they shall see proper, to divide the two Premiums allowed for Bulls into three Premiums, in such proportions as they shall approve; the first Premium for Bulls not being less than Eight Sovereigns; and, in like manner, to divide the sums allowed for Queys into three Premiums, fixing their amount.

2. The Committee shall not place for Competition any stock which, in their opinion, does not fall within the regulations prescribed, or does not possess merit; and in no instance shall any of the Money Premiums be awarded, where there are not, after such selection, at least three Competitors, reserving to the Committee, in the case here provided for, to make such allowance to a party shewing stock of merit, not exceeding half the amount of the Premium, as, under the circumstances, they may think reasonable.

3. The times, and also the places of Competition, are to be fixed by the Convener, with the advice of at least a quorum of their respective Committees, except in the 6th and 10th districts, as to which Elgin and Forres alternately, commencing with Elgin, are named as the places of Competition for the former, and in the latter Benbecula is fixed. The Competitions for the Society's and for the District Premiums are to take place between the 1st of June and 1st day of November next.

4. The Convener of each Committee will give timely notice to the other Members of the Committee of the place and time of the Competition, and will be particularly careful that the same be intimated at the several parish-church doors within the District, for at least two successive Sundays previous to the Competition, or in such other form as shall be previously approved of by the local Committee.

5. As these Premiums were given, in some of the above-mentioned Districts, in 1834, 1835, 1836, and also in 1837, it is to be observed that the Society does not admit an animal, in any class of stock, which may have gained the Society's first Premium at a District or General Show in a former year, to be again shewn in Competition in any District; and for no description of stock shall either the same or a lower denomination of Premium be awarded, in the District in which they have already gained a Premium. In those Districts where the Honorary Silver Medal is offered for Bulls, Tenants cannot compete with the same animal both for the Honorary and the Money Premiums.

6. No Member of the Committee, shewing Stock of his own at the Competition, shall act as judge; nor shall Factors, when they are Members of the Society, and are named on the Committee, or when acting in the absence of Proprietors, be entitled to compete for the Money Premiums in these Districts and Classes in which Proprietors are excluded from Competition. It is recommended to the Committee to take the assistance of practical men as judges in awarding the Premiums. In all cases, the Bulls for which the Money Premiums are awarded, must have served, or shall be kept to serve, the District, for at least one season, at a moderate charge for each Cow, and the rate may be fixed by the Committee. The same person is not to obtain more than one of the Premiums for Bulls, nor more than one of the Premiums for Queys, in one year, except in those Districts where Tenants compete for the Honorary and Money Premiums for Bulls, in which case they may, with different animals, carry the Medal and one of the Money Premiums. While the Directors have deemed it expedient to exclude Proprietors and Factors named on the Committee, or acting in the absence of Proprietors, from competing for the Money Premiums in certain Districts where it is apprehended that the ownership of their stock might discourage competition on the part of the Tenantry, they are fully impressed with the advantages of having such stock exhibited at the District Shows, and have offered the Honorary Silver Medal of the Society for the best Bull exhibited at the Competition, should he be the property of one in that class, and superior to the Bull to which the highest Money Premium is awarded. A Bull which, as the property of a Proprietor, may have gained the Honorary Medal, will be allowed to compete in a future year for the highest Money Premium, when *bona fide* the property, and in the possession of a Tenant, provided it should have continued the Proprietor's property for at least one year after the award of the Medal, and shall have afterwards been the Tenant's property, and in his possession from the day fixed by the regulations (20th May). A Bull which may have been purchased by two or more Tenants for the use of their stocks, will be allowed to compete, although the exhibitors may not be joint tenants.

7. In order to entitle the Competitors to their respective Premiums, a regular Report, signed by the Convener, and at least a majority of the Committee who attend the Competition, must be transmitted by the Conveners, so as to be received by the Secretary on or before the 10th of December next, and which Report must specify the ages of the Bulls and Queys preferred; the length of time the Bulls have been in the possession of the Competitors; and, with respect to the Queys, that they were bred by the Competitors, except in the 5th District, and were their property on the day of Competition; the number of Bulls and Queys respectively produced thereat; the number placed for Competition in each class; the names and designations of the persons to whom the Premiums have been adjudged; amount of Premiums voted to each; and, in general, that all the Rules of Competition fixed by the Society, as above mentioned, have been strictly

observed; and, in particular, that the previous intimations to the Committee of Judges, and advertisements at the church doors, were regularly made as required. In case all the Members of the Committee who may have attended shall not have subscribed the Report, the Convener will mention the cause which may have prevented their doing so.

Further, it is to be distinctly understood, that in no instance does any claim lie against the Society for expenses attending a Show of Stock, beyond the amount of the Premiums offered.

With reference to the Competitions in the 1st, 2d, 5th, 10th, and 11th Districts, the Reports must bear that the Bulls and Queys preferred were of the West Highland breed; in the 4th, of the Fifeshire breed; and in the 6th, 7th, 12th and 14th, of the Aberdeenshire breed, the 12th being limited to the Polled Aberdeenshire. A certain portion of the Premiums in the 8th District is authorized to be assigned to Stock of the Short-Horn breed, and a portion to the Ayrshire breed.

Conveners are requested to get the Reports drawn up and signed by a majority of the Committee present at the Competition before they separate.

NOTE.—The Society, impressed with the benefit to be derived from continuing these Competitions in the same Districts for a longer period than was formerly the practice, gives the Premiums for three Competitions in alternate years; and provided the Gentlemen of the District, or any Local Association therein, shall have continued the Competitions, and have awarded Premiums in the District to an amount not less than one-half the Society's Premiums, and for the same description of Stock, during the two intermediate years, the Society continues its Premiums to the District for an additional year. By this arrangement each District may have the benefit of six Competitions. In Districts Nos. 1, 2, and 3, 1834 was the first year's Competition; Local Premiums were awarded in 1835 and 1837, and this year they have consequently the fifth, and will next year have the sixth, or additional year's Competition. In Districts 4 and 5, 1836 was the first year's Competition; Local Premiums were awarded in 1837, and this year these two Districts have the Society's Premiums, which will be again given in 1840, and also in 1841, if they award Local Premiums in 1839. In the Districts Nos. 6, 7, and 8, this is the first year's Competition for the Society's Premiums; they will be entitled to the Society's Premiums in 1840 and 1842, and also in 1843 if they award Local Premiums in 1839 and 1841. In Districts Nos. 9, 10, 11, 12, and 13, 1835 was the first Competition; they had the Society's Premiums in 1837, and will again have them in 1839, and also in 1840, in such Districts as shall have awarded Premiums in the intermediate years. In District 14, 1837 was the first Competition; and it will again have the Society's Premiums in 1839 and 1841. If it award Premiums in the intermediate years, it will have the Society's Premiums for the additional year in 1842. The District No. 15 is now offered for 1839 as the first year's Competition, and the Premiums will be continued in 1841 and 1843; and if the District gives Premiums in 1840 and 1842, the Society's Premiums will be again given in 1844. Farther, in order to encourage the Show for the Local Premiums, the Society, in those Districts in which the Honorary Silver Medal is given, will continue it in the two intermediate years, under the same conditions as during the years when the Society's Premiums are given. A certificate of the Competition and Premiums awarded at the intermediate Local Shows in the several Districts,

signed by at least two Members of the Society, must be transmitted to the Secretary of the Society, so as to be received by him on or before the 10th December in each year, in order to entitle the Districts to any claim for the additional year's Premiums.

§ II. WORK HORSES.

PREMIUMS FOR IMPROVING THE BREED OF DRAUGHT-HORSES.

1. *The Upper and Middle Wards of Lanarkshire.*
2. *West Tiviotdale—Roxburghshire.*
3. *The Rhinns of Galloway—Wigtonshire.*

In each of the above districts Twenty-five Sovereigns will be given by the Society, a Sum not less than Twenty Sovereigns additional being given by the resident gentlemen, or by Local Societies, for the improvement of the breed of Draught-Horses. The premiums to be as follows:—

For the best Stallion, not under three years and nine months, and not exceeding twelve years old, kept exclusively for the improvement of the breed of Draught-Horses, within the said district No. 1, and for this purpose to be shewn after the premiums ~~have been awarded~~ at such stations as may be fixed by the Conveners and ~~Committee of members~~ of the Society resident in the district, for service of not more than seventy Mares, at a rate not exceeding one Sovereign for each, at such times between the 1st April and the 1st August 1838 as the Committee may fix, at a meeting to be called by the Conveners for the purpose—Twenty-five Sovereigns.

For the best Mare for breeding Draught-Horses, not exceeding twelve years old, and which shall have had at least one foal, *bona fide* the property and in possession of any tenant in the said district No. 1, from 1st January 1837 to the day of competition—Ten Sovereigns.

For the best entire Colt, not exceeding forty-five months old, *bona fide* the property of any proprietor or tenant in the said district No. 1.—Ten Sovereigns.

NOTE.—The premium to the best Stallion must be awarded under the condition, that the Prize Mare, and the Mare which shall be declared by the Judges next in merit, shall have a preference of service by the Prize Stallion, free of charge; all the competing Mares to have a preference over other Mares to service by the Prize Stallion, on such terms and conditions as the local Committee shall fix, but the charge in no case to exceed the sum indicated by the terms of the Premium. Evidence must be produced that the Prize Stallion has had produce.

RULES OF COMPETITION.

The time and place of competition for the Premiums are to be fixed by the Conveners, with the concurrence of at least a quorum of the Committees, and are to be published by the Conveners at the Church doors, in due time, or in such other manner as shall be thought by them, and a quorum of the Committee, effectual for the information of those interested.

The competition will take place in the first District betwixt 20th March and 1st May 1838, and in the second and third Districts within the same period in 1839. The regulations for cattle shows, in regard to fixing the competitions,—the previous intimation to the Committee and competitors,—the recommendation to the Committee to take assistance of practical men as judges,—the power of the Committee to withhold the Premiums, if the animals produced shall be of inferior character,—those relating to extra expenses, and against competitors being also judges,—and the manner in which the Reports are to be certified and transmitted to the Society, are severally hereby declared applicable to the premiums for horses.

The premiums now intimated are for the first competition in the Districts, Nos. 1 and 3, and for the second competition in the District No. 2. The expediency of continuing the premiums for another year in the first and third Districts is open for consideration, provided the Districts shall respectively propose again to guarantee a sum equal to what they now contribute.

The Members of the Society in the respective districts are appointed Committees for regulating every thing relative to the competitions, with power to name Sub-Committees of their number for attending to the necessary details.

FOR THE FIRST DISTRICT.—The Right Hon. Lord Belhaven and Sir Norman Macdonald Lockhart, Bart., or either of them, to be Conveners of the resident Members; three a quorum.

FOR THE SECOND DISTRICT.—His Grace the Duke of Buccleuch, in his absence Allan Elliot Lockhart, Esq. of Cleghorn, to be Convener of the resident Members; three a quorum.

FOR THE THIRD DISTRICT.—The Right Hon. the Earl of Gallovay, in his absence Colonel Hunter Blair, of Dunskey, to be Convener of the resident Members; three a quorum.

§ III. SHEEP AND WOOL.

PREMIUMS FOR IMPROVING THE BREED OF SHEEP IN THE FOLLOWING DISTRICTS.

1. *The following District in Inverness-shire, viz. from the Ferry of Balachulish on the west, to the march of Letterfinlay, with Glengarry on the east, including both sides of Loch Lochy, both sides of Loch Arkeg, Lochiel until it reaches Glenfinnan, the whole of Glenspean and Glenroy, so far as the Badenoch march on both sides, and also including the District of Ardgour in Argyllshire.*

2. *The Districts of Badenoch and Rothiemurchus in Inverness-shire.*
3. *The Districts of Morven, Ardnamurchan, and Kingerloch, Argyllshire.*

For the best six Tups of the Black-faced breed, not exceeding four years old, the property of any proprietor or tenant in each of the said two first districts, which shall be certified at the Competition to belong to a flock of not less than 120 Ewes, and to have been no otherwise grazed or fed during the last season than the exhibitor's Tups of the same age, and to have served the Ewes of the flock in the same manner, and at least for one month of the season—Six Sovereigns.

For the second best six ditto—Four Sovereigns.

For the best Pen of eighteen Gimmers or Ewes of the Black-faced breed, from sixteen to twenty months old, the property of any proprietor or tenant within each of the said two first Districts, and which shall be certified at the Competition to have been at least one year in his possession, and to have been, during that year, grazed, on the same kind of pasture with the remainder of the flock of the like age—Six Sovereigns.

For the second best pen as aforesaid—Four Sovereigns.

Premiums for Tups and Gimmers of the Black-faced breed, and for Tups of the Cheviot breed, will be given in the third District in 1839, as the second Competition for the Society's Premiums. The Competitions to be held at Keil, and at Strontian alternately.

The following Members of the Society are appointed Committees for awarding the Premiums for Sheep.

FOR THE FIRST DISTRICT—The Marquis of Huntly—The Earl of Aboyne—Sir Duncan Cameron of Fassfern, Bart.—Donald Cameron, Esq. of Locheil—John Cameron, Esq. Corrychoiley—James Greig, Esq. Tullich—Major-General Macdonell, Coldstream Guards—Colonel Maclean of Ardgower—Captain John Macdonell, Killihonet—Thomas Macdonald, Esq. Fort William—James Macgregor, Esq. Fort William—John Walker, Esq. of Crawfordton, and any other Members resident in the District; three a quorum.—Sir Duncan Cameron and Colonel Maclean of Ardgower, or either of them, to be Convener.

FOR THE SECOND DISTRICT—The Duke of Bedford—Sir Joseph Radcliffe, Bart.—Ewen Macpherson, Esq. of Cluny—George Macpherson Grant, Esq. of Ballindalloch and Invereshie—John Macpherson Grant, Esq. younger of do.—Colonel Duncan Macpherson—Major Macpherson of Glentruim—Allan Macpherson,

Esq. Kingussie—William Mitchell, Esq. of Gordonhall, and any other Members in the District ; three a quorum.—Cluny Macpherson ; in his absence, Major Macpherson, Glentruim, to be Convener.

FOR THE THIRD DISTRICT—Sir James Miles Riddell, Bart. ; in his absence, John Gregorson, Esq. of Ardtornish, to be Convener of the Committee of Resident Members.

RULES OF COMPETITION.

The Competition for the Premiums in the First and Second Districts will take place on such days between the 1st of June and the 1st of November 1838, as shall be fixed by the Conveners, with the advice of a quorum of their respective Committees ; and the Conveners are hereby empowered with the same advice to fix the respective places of Competition for these Districts. Strontian is fixed as the place of Competition for the Third District in 1839. It is recommended to the Committee, as in the case of cattle competitions, to take the assistance of practical men as Judges in awarding the Premiums. The Judges, in deciding the Premiums for Sheep, will have regard both to the wool and carcass of the animal. The regulations for cattle shows, in regard to the previous intimations to Judges and Competitors,—the placing of the stock, and the number of Competitors required for Competition,—the power to make provisionally an allowance for Stock of merit in the event of deficiency in number, and prohibiting Members acting as Judges who are also Competitors,—the regulations relating to Extra-expenses—and the manner in which the Reports are to be certified and transmitted, are severally hereby declared to be applicable to the Premiums for Sheep.

The NOTE annexed to the rules of competition for the Premiums for Cattle, is also applicable to the Districts for Sheep, in which the Premiums will be continued by the Society for an additional period, on the conditions specified in the said Note. In the first District this is the third year's competition, and it will be entitled to the fourth or additional year's Premiums in 1839, if it shall have awarded local Premiums in 1835 and 1837. In the second District, this is the second year's competition for the Society's Premiums ; it will have these again in 1840 ; it awarded local Premiums in 1837, and if it award these also in 1839, it will have the Society's Premiums in 1841, as the additional year. In the third District, 1837 was the first competition, and it will have the Society's Premiums again in 1839 and 1841, and also in 1842 if it awards local Premiums in 1838 and 1840.

§ IV. SWINE.

PREMIUMS FOR IMPROVING THE BREED OF SWINE.

1. *The County of Inverness.*
2. *The District of Fettercairn, Kincardineshire.*

For the best Boar, not under twelve months, and not exceeding four years old, *bona fide* the property and in possession of any proprietor or tenant in the first district, in autumn 1838—Seven Sovereigns.

For the second best—Three Sovereigns.

For the Best Breeding Sow of the same age—Four Sovereigns.

For the second best—Two Sovereigns.

These premiums to be awarded for animals that are considered most profitable, and best suited for the purpose of curing mess pork. Attention is recommended to the introduction of the Berkshire or Suffolk breed of Swine, as being the best for curing pork.

Similar Premiums will be given in the second district in 1839.

The Competitions are to be held at such times as the Society's Members resident in the district shall fix, at a meeting to be intimated by the respective Conveners for the purpose. This meeting is also authorized to name a Committee for managing all details, and to fix the necessary regulations for competition.

A Report of the award of the Premiums, with a copy of the Regulations of Competition, to be transmitted to the Secretary on or before the 10th of December 1838, for the First District, and by the same date in 1839 for the Second District. Inverness is fixed as the place of Competition for the First District.

FOR THE FIRST DISTRICT.—John Stewart, Esq. of Belladrum, and William Macintosh, Esq. of Geddes; in their absence, J. Macdonald, Esq. banker, Inverness, to be Conveners.

FOR THE SECOND DISTRICT.—The Right Hon. Viscount Arbuthnot; in his absence, Sir John Stuart Forbes of Pitsligo and Fettercairn, Bart., to be Convener.

CLASS VII.

PRODUCTS OF LIVE STOCK.

§ I. CURING BUTTER.

DISTRICTS.

1. *The District of Perthshire, comprehending the Parishes of Dunblane, Kilmadock, Port of Monteith, Aberfoyle, and Kincardine.*
2. *The County of Caithness.*
3. *The Islands of Orkney.*

The Premiums given, and regulations suggested, for promoting an improved system of Curing Butter, having been productive of highly satisfactory results, the following Premiums are offered in the First District in 1838.

To the owner of any Dairy in the said First District who shall make and cure the best quality of Butter for the market, not being less than two cwt. (112 lb. to the cwt. and 16 oz. to the lb.) during the season 1838—Six Sovereigns.

For the second best quality, as aforesaid—Four Sovereigns.

For the third best quality, as aforesaid—Three Sovereigns.

For the fourth best quality, as aforesaid—Two Sovereigns.

Similar Premiums to be given in the Second and Third Districts in 1839, as the second year's competition. In the Third District, the minimum quantity to be one cwt.

CONDITIONS.

The Butter in the First District must be certified to have been made and cured on the competitor's farm during the season 1838; and the certificate must be supported by the declaration of the exhibitor, which must further bear, that the sample produced is a fair average of the quantity made and cured as aforesaid. It shall be inspected by a Committee of the Members of the Society resident within the district. The Committee, at any meeting to be called by the Convener for that purpose, shall fix such general regulations as they may consider proper; and they will in particular fix the place and day of Competition, and the quantity of Butter to be produced by Competitors as a fair specimen. It is suggested as proper to be required, that a firkin made in each of the three months of July, August, and September, shall be exhibited. The quality of the Butter to be tested by judges to be named by the Committee, in the way usually done by purchasers in the public market. In the event of two or more competing lots being deemed equal in quality, the premium will be awarded to the larger quantity. Although not required as a condition, it is strongly recommended, as affording facilities for sales, that the Butter should be packed in firkins, containing 56 lb. each, or in earthen vessels which have not been glazed with preparations of lead, and of such size as may be suitable for sales. The successful candidates, before receiving the Premiums, are required to transmit to the Secretary a detailed report of the whole process followed by them in the manufacture of their Butter. Reports of the award of the Premiums in the First District, to be lodged with the Secretary of the Society, on or before the 10th December 1838.

H. Home Drummond, Esq. of Blairdrummond; in his absence J. Burn Murdoch, Esq. of Coldoch, to be Convener in the First District.—James Traill, Esq. of Ratter; in his absence William Horne, Esq. of Scouthell, and James Sinclair, Esq. of Forss, or either of them, to be Conveners in the second District.—John Bruce, Esq. of Sumburgh, to be Convener in the Third District.

2. MAKING CHEESE.

The Society having for a series of years given Premiums in the Dairy Districts of Scotland for the most approved descriptions of Cheese, with results highly satisfactory, specimens, at remunerating prices, having been produced of superior quality, of the finer descriptions of Cheese, which it had been supposed could not be successfully made in Scotland, it has been resolved to give further encouragement to bring forward superior Cheese, by offering Premiums open to all Scotland as follows:—

PREMIUMS.

1. For the best Cheese of the quality denominated Double Gloucester—Eight Sovereigns, or Plate of that value.
2. For the best Cheese of the quality denominated North Wiltshire—Eight Sovereigns, or Plate of that value.
3. For the best Cheese of the quality denominated Cheshire—Eight Sovereigns, or Plate of that value.
4. For the best Cheese of the quality denominated Stilton—Eight Sovereigns, or Plate of that value.
5. For the best Cheese made from Skim Milk—Eight Sovereigns, or Plate of that value.
6. For the best Cheese of any new variety differing in taste and flavour from the kinds above specified—Eight Sovereigns, or Plate of that value.

CONDITIONS.

The several varieties above mentioned to be made in 1838. Intending Competitors must lodge, with any Member of the Society in their neighbourhood, before the 1st of June next, a ~~transmission~~ specifying the description or descriptions of Cheese for which they intend to compete, and the quantity proposed to be made, which must not be less than 1 cwt. of any variety. Each competitor in the classes Nos. 1, 2, 5, and 6, must lodge with the Secretary, at the Society's Hall, on or before the 10th of December 1838, specimens of the Cheese for which he is to compete in these classes, of not less than 16 lb. imperial weight, in not more than two cheeses, accompanied by a declaration that the specimens are fair average samples of the whole cheese made by the competitor during the season, of the description for which he competes. In Class 5 the declaration must bear that neither cream nor uncreamed milk has been used, and that the milk had not stood less than twelve hours before the cream was taken off.—The declaration in the several classes to be sealed, and to bear upon the envelope a motto or mark corresponding to the distinguishing mark upon the cheese, to which it has reference.

The specimens of Cheshire and Stilton Cheese (classes 3 and 4) to be lodged, with declarations as above mentioned, on or before the 10th of December 1839.

The successful competitors, before receiving payment of their premiums, shall, if required, transmit to the Society a detailed report of the whole process employed by them in the manufacture of their cheese.

Members of the Society, to whom intimation may be given by intending competitors, are particularly requested to visit the dairies during the season, and to report upon them, and particularly upon the progress made in cheese-making in general in their district since the Society first directed attention to this important object.

CLASS VIII. COTTAGES.

1. PREMIUMS FOR THE BEST KEPT COTTAGES AND GARDENS. DISTRICTS.

1. *The County of Lanark.*
2. *The County of Fife.*
3. *The County of Mid-Lothian.*
4. *The County of Selkirk.*

In order to encourage Cottagers to keep their cottages and gardens neat and clean, the Society will, for four successive years, give two Sovereigns annually to any parish in each of the said counties, or to any local Association, comprehending at least one parish within the object of its operations, on receiving a satisfactory guarantee from or on behalf of the parish or Association for an equal sum being placed at the disposal of the Society, for the same purpose, and during the same period. The number of parishes to receive the Premiums is to be limited to four in each county. Guarantees have been lodged for two parishes in Lanarkshire, and for four parishes in the County of Fife, and the Premiums will be competed for in these parishes in 1838, and in the three following years. The guarantees for parishes intending to claim in the Counties of Mid-Lothian and Selkirk must be lodged by 1st January 1839, and the Premiums for these counties will be competed for in that and the three following years. If guarantees shall be lodged from more than four parishes in any of the counties, within the time limited, the preference will be given to those which have been first received.

PARISHES IN COMPETITION IN 1838, &c.

Lanarkshire.

PARISH OF CULTER.—Convener, R. G. Baillie, Esq. of Coulter-allers.

PARISH OF AYONDALE.—Convener, Robert Brown, Esq. Hamilton.

Fifeshire.

PARISH OF KINGHORN.—Convener, the Earl of Rosslyn.

PARISH OF SCOONIE.—Convener, Major Anderson of Kingask.

PARISH OF MARKINCH.—Convener, Major Anderson.

PARISH OF KENNOWAY.—Convener, J. B. Fernie, Esq. of Kilmux.

PREMIUMS.

1. For the best kept cottage in each of the said parishes—Two Sovereigns.
2. For the second best kept ditto—One Sovereign.
3. For the best kept Cottage Garden in each parish—One Sovereign.

CONDITIONS.

The names of intending Competitors must be intimated to the Conveners appointed by the Society, on or before the 20th of April in each year, otherwise they shall not be allowed to compete. The inspection of the Cottages and Gardens to take place between 12th June and 12th August.

In order to authorize the awarding of the Premiums, the annual value of the Cottage of the Competitor, with the ground annexed, must not exceed £5 Sterling, and there must at least be two Competitors in the district. No Cottage nor Garden for which a Premium has been awarded by the Society, will be admitted in competition again for the same or a lower Premium. If the Cottage competing is occupied by the proprietor, the roof must be in good repair. If the roof is of thatch, it must be in good repair, though in the occupation of a tenant. The windows must be free of broken glass, and perfectly clean, and must afford the means of ventilation. Dung-hills and all other nuisances must be removed from the front and gables. The peat-stacks, if any, must be so placed as not to be a deformity; and the interior of the Cottage must be as cleanly kept as the nature of the Cottage admits of. In awarding the Cottage Premiums, the preference will be given to those who, in addition to these requisites, have displayed the greatest taste in ornamenting the exterior of their houses, with the ground in front and at the gables.

In estimating the claims of competitors for the Garden Premium, the Judges will have in view, 1st, The sufficiency and neatness of the fence; 2d, The cleanliness of the ground, and neatness of the walks; 3d, The quality of the crops, and general productiveness of the Garden; and 4th, The choice of crops. Much advantage is derived in some districts in Scotland from Cottagers cultivating, besides the more common crops, a portion of early potatoes along with the late, of early cabbage, early pease, cauliflower, lettuce, with some gooseberry and currant bushes, and a fruit-tree trained against the wall, &c.

Reports stating that the various particulars before mentioned have been attended to, the number of competitors, the names of the successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary of the Society, on or before the 20th day of October in each year.

NOTE.—Similar Premiums will be given, on the same conditions, in the counties of East Lothian and Orkney and Zetland in 1840.

2. MEDALS TO COTTAGERS.

In the view of giving still farther encouragement to Cottagers of the above description, who do not reside in the counties in which the regular premiums are in operation, and at the same time of giving aid to local associations and public-spirited individuals, establishing or continuing, at their own expense, premiums for the like object, the Society will give its Cottage Medal to such associations or public-spirited individuals as apply for the same, and may be desirous to add that testimony of approbation to such premiums as they themselves bestow. The number of Medals to be issued annually is limited to six.

Applications for these Medals, stating the nature and amount of the encouragement which is to be afforded by the parties applying, to be made to the Society on or before the 1st of July in each year, so that the Association or individual making the application may be enabled to intimate that the Medals are to be

given. The Medals will afterwards be issued upon a Report, certified in the terms required by the preceding conditions, describing the merits of the Cottagers. The Reports to be lodged with the Secretary before the 10th November of the year in which the application is made.

3. PREMIUMS TO COTTAGERS FOR PROMOTING ATTENTION TO THE CULTIVATION AND MANAGEMENT OF BEES.

1. *The Counties of Selkirk and Peebles.*
2. *The Counties of Lanark and Renfrew.*

To the Cottager in the 1st District, paying £5 of rent or under, or whose cottage, and land annexed to it, does not exceed that annual value, who, between the 1st of June and 1st October 1838, shall have raised the greatest number of Hives of Bees, not fewer than Seven, from stocks of his or her own property, none of the hives weighing under 20 lb. exclusive of the weight of the material of the hive or skep—A Premium of Four Sovereigns.

To the Cottager in the same district who shall have raised the second greatest number, as aforesaid—Three Sovereigns.

To the Cottager in the same district who shall have raised the third greatest number—Two Sovereigns.

To the Cottager in the same district who shall have raised the fourth greatest number—One Sovereign.

Certificates of the number of Hives, and their several weights, making allowance for the weight of the skeps (which must be weighed before being used), signed by two Members of the Society resident in the neighbourhood, or by one Member and the Clergyman of the parish, to be transmitted to the Secretary on or before the 10th November 1838.

Similar Premiums will be given in the Second District for Hives raised between the 1st June and 1st October 1839.

CONVENERS FOR SELKIRKSHIRE.—Alexander Pringle, Esq. of Whytbank, M. P., and W. J. Fraser, Esq. Gala House.

CONVENERS FOR PEEBLESHIRE.—Sir John M. Nasmyth of Pogo, Bart., W. F. Mackenzie, Esq. of Portmore, M. P., and William Forbes, Esq. younger of Medwyn.

In order that the Premiums offered may be made known to the industrious Cottagers, the Society trusts much to the obliging co-operation of the Clergy in the Counties in which the Cottage Premiums are in operation.

CLASS IX.

WOODS AND PLANTATIONS.

1. HONORARY PREMIUM FOR EXTENSIVE PLANTING.

To the Proprietor who shall, within a period of five years immediately preceding, have planted on his property the greatest extent of ground, not being less than 500 acres, and who shall communicate to the Society, on or before the 10th of November in any year, a satisfactory report of his operations, embracing the expense, description of soil, age, and kind of Trees planted, the number of each sort per acre, mode of planting, extent of "beeting up," and general progress of the plantation, with such observations as his experience may suggest—The Gold Medal.

2. REPORTS ON RECENT PLANTATIONS.

To the Proprietor who shall communicate to the Society, on or before the 10th of November in any year, the most satisfactory Report on the Planting of Land, founded on experiment; and who shall, accordingly, have planted on his own property an extent of not less than Fifty acres, within a period of seven years preceding the date of his Report—The Gold Medal.

The Report should comprehend every interesting particular; among others, the exposure and altitude of the place, and general character of the soil—the mode of fencing and of planting adopted—the kind of trees planted, and the number of each kind per acre—their relative progress—the proportion of blanks or deaths at the end of three years—the state of the plantation at the date of making the Report, and the expense per acre, as nearly as can be calculated.

3. NATIVE FIR WOODS.

For the best and approved account of any of the Districts of Scotland where the *Pinus sylvestris* is indigenous, and abounds so as to constitute a native forest—The Honorary Silver Medal.

The Society has already received a Report on the Glenmore, Duthill, Rothiemurchus, and Abernethy Forests, which will be forthwith published in its Transactions. Competitors will avoid giving the same information as is there contained.

It will be expected that a view should be given both of the past and present state of the woods to which the Report has reference, and of the nature of the situations, and of the *soil* and *subsoil* where the trees appear to thrive best. It will be desirable, also, that measurements of some of the largest trees should be given, and a statement of their age, as far as it can be ascer-

tained, by counting the rings or annual layers on felled trees of similar dimensions. The comparative growth of any other native trees which occur in the District, such as Birch or Oak, should be mentioned, and the undergrowth and general state of the pasture-herbage should be described. Any circumstances which may appear to the writer likely to throw light on the growth and management of native fir woods, should be adverted to; and, in particular, how far the observation is well founded, that the best trees have a northern exposure, or are found in woods having a north aspect or inclination.

4. FIR PLANTATIONS.

For the best and approved account of the Fir Woods in any District of Scotland to which the *Pinus sylvestris* is not indigenous, including the various particulars above mentioned—The Honorary Silver Medal.

5. COLLECTING THE SEEDS OF THE SCOTS FIR OR *PINUS SYLVESTRIS* FROM NATIVE TREES IN SCOTLAND.

To the Person in Scotland who shall, between 30th October 1836 and 30th October 1840, have collected and sown, or sold for sowing, the greatest quantity of Seeds of the Scots Fir or *Pinus sylvestris* from healthy and free growing trees of natural growth in the Highland Districts of the Counties of Aberdeen, Moray, Inverness, or Perth, the quantity to be not less than 1500 lb. clean seeds—The Gold Medal, or a Piece of Plate of that value.

Competitors to transmit to the Secretary of the Society, on or before the 10th of November 1840, a declaration in support of the collection of the seed from proper trees, specifying the quantity collected in each year, and the District where it was gathered, stating also whether the seed had been sown or sold, and in the latter case the name of the purchaser. The expense of collecting, and if sold, the price obtained, should likewise be reported.

6. IMPORTING THE SEEDS OF THE *PINUS SYLVESTRIS*, COLLECTED FROM TREES IN THE NATIVE FORESTS OF THE CONTINENT.

To the Person in Scotland who shall, between the 30th of October 1836 and the 30th of October 1840, have imported from Germany or Switzerland, or from Norway, Sweden, or Russia, and sown, or sold for sowing, the largest quantity of the Seeds of the *Pinus sylvestris* (Kiefer, or Föhre, or Rößör), taken from full grown healthy trees in those countries, but in no case from trees situated in the immediate vicinity of the sea, the quantity not to

be less than 1500 lb. of clean seeds—The Gold Medal, or a Piece of Plate of the same value.

Competitors to transmit to the Secretary of the Society, on or before the 10th of November 1840, evidence (the best that can be obtained) in support of the collection of the seed from proper trees, specifying the District where it was collected, and the Commercial Firm through whose means it was imported; also whether it had been sown in this country by the importer, or sold for that purpose, and, in the latter case, the name of the purchasers. The cost price, and, if sold, the price obtained, to be also stated.

7. INTRODUCTION OF NEW AND EXTENDED CULTIVATION OF THE RARER USEFUL FOREST-TREES INTO SCOTTISH PLANTATIONS.

To the person who shall, on or before the 30th of October in any year, report to the Society the successful introduction into Scottish Plantations, of any new ornamental or useful Forest-Tree, or the successful extended cultivation of any of the rarer useful sorts already known, but which have not hitherto received the attention which their merits would warrant—The Silver Medal, or a Piece of Plate of such value as the communication may be adjudged to deserve.

Attention is more particularly directed to such trees as will grow in situations unfavourable to the health of the more generally known sorts, as elevated mountains, peaty and sandy tracts, exposed marine situations, and in regard to the last of these, it is especially wished to ascertain the value of the *Pinus pinaster*, or the *Pinus maritima major* of the French.

Satisfactory evidence will be required that the tree reported upon is of new or recent introduction, or that it has not hitherto received that extended cultivation which, from its value, it may have merited; and that the soil and situation for which it is recommended are congenial to its habits. A particular account of its nature and habits, nursery and after-management, uses and value of its timber, or effect in landscape scenery; and if new, an account of its introduction, must be furnished, accompanied by a specimen of the branches and foliage, and, if possible, a specimen of the wood and also of its fruit.

8. INTRODUCTION OF FOREST-TREES NOT YET KNOWN IN A LIVING STATE IN SCOTLAND.

To the person who shall, in any year, most successfully transmit to the Society, in a state fit for germination, Seeds of Forest-Trees not yet in cultivation in this country, and which are natives of such

places as, from their latitude or altitude, may be expected to produce trees hardy in the climate of Scotland—The Gold or Silver Medal, or a Piece of Plate of such value as the Directors in the circumstances of the case may think suitable.

The Society would particularly wish to direct (but by no means to confine) attention to the Fir Tribes; and the countries from which contributions are particularly expected are the north-west part of America, the table-land of Mexico, such parts of the Andes as have sufficient elevation, and the Himalaya Mountains or the great plains to the northward of them. The seeds may be sent home in the cones, wrapped in brown paper, packed in a box, and kept in a cool airy part of the cabin, but by no means in the hold, nor in close tin cases. If Competitors possess the means, by themselves or their correspondents, of trying their vegetation in this country, it will be desirable that they should do so; but otherwise, if the seeds be sent to the Secretary of the Society, they will be tried under the direction of the Society, so as to afford every chance of success. The transmission of living plants in boxes, or in cases covered with glass panes, may be attempted, where practicable; the external air should be excluded, and almost no water given during the voyage. Where this plan is adopted, smaller seeds, berries, or heps, may be thickly mixed with the soil or earth in which the plants are placed.

9. MORE EXTENDED INTRODUCTION OF KNOWN SPECIES OF THE FIR TRIBE.

To the person who shall, within three years from 1835, inclusive, have introduced from any part of the world, cones containing seeds capable of germination, the produce of hardy species of the Fir Tribes which have been already introduced into Britain, but of which only a few plants have been raised—The Gold or Silver Medal, or a Piece of Plate of such value as the Directors may, in the circumstances of the case, deem adequate.

It is required that the quantity of cones of each species imported shall be sufficient to afford at least 500 seedling plants; and farther, that before the Premium be awarded, the number of seedling plants of each species actually raised in Scotland shall not be less than 100. Attention is particularly directed to *Araucaria imbricata*, *Pinus ponderosa*, *Lambertiana*, and *Sabiana*; to *Abies Douglasii*, *nobilis*, *grandis*, and *Menziesii*; and to *Taxodium sempervirens*, which last is abundant in the vicinity of St Francisco, and throughout the low sandy plains of California.

CLASS XI.
GENERAL SHOW OF LIVE STOCK,
AND

AGRICULTURAL MEETING AT GLASGOW IN 1838.

The Society having resolved to hold the General Show of Live Stock and Agricultural Meeting for 1838 at Glasgow, the following Premiums are offered to be then awarded, aided by liberal donations from the counties of Lanark, Renfrew, Dumbarton, and Argyll, and from the City of Glasgow:—

§ I. CATTLE.

SHORT-HORNED BREED.

CLASS I. For the best Bull, calved between 1st January 1833 and 1st January 1836—Twenty-five Sovereigns.

For the second best ditto—Ten Sovereigns.

To the *Breeder* of the best Bull in this Class—The Honorary Silver Medal.

It is a condition attached to these Premiums, that the exhibitors shall be obliged to let out the Prize Bulls to serve at least forty Cows during the season 1839, within such portion, and at such places of the four counties of Lanark, Renfrew, Dumbarton, and Argyll, as the Local Committee shall fix, on payment of Ten Shillings and Sixpence for each Cow. The owner, if resident within the district, to have a preference of service for his own Stock.

II. For the best Bull Stirk, calved after 1st January 1837—Seven Sovereigns.

III. For the best Cow of any age—Ten Sovereigns.

IV. For the best Ox, calved after the 1st January 1836—Seven Sovereigns.

V. For the best Heifer, calved after 1st January 1836—Seven Sovereigns.

AYRSHIRE BREED.

VI. For the best Bull, calved between 1st January 1833 and 1st January 1836—Twenty Sovereigns.

For the second best ditto—Ten Sovereigns.

To the *Breeder* of the best Bull in this Class—The Honorary Silver Medal.

A similar condition is attached to the Premiums in this Class as is above intimated in reference to the Premiums in Class I.

VII. For the best two-year-old Bull, calved after 1st January 1836—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

VIII. For the best Bull Stirk, calved after 1st January 1837—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

IX. For the best Milch Cow, calved prior to 1st January 1835—Fifteen Sovereigns.

For the second best ditto—Seven Sovereigns.

X. For the best Cow, calved after 1st January 1835—Seven Sovereigns.

For the second best ditto—Five Sovereigns.

XI. For the best two Cows in milk, calved after 1st January 1836—Seven Sovereigns.

For the second best two ditto—Five Sovereigns.

XII. For the best three Cows, of any age, in milk, and having had calves the season preceding the Show—Ten Sovereigns.

For the second best three ditto—Five Sovereigns.

No Cow shall be allowed to compete unless there shall be lodged with the Secretary a declaration, by the person in charge of the Cow, that he had witnessed the Cow milked dry after five o'clock on the morning of the Exhibition.

XIII. For the best two Queys, calved after 1st January 1836—Seven Sovereigns.

For the second best two ditto—Five Sovereigns.

XIV. For the best two Oxen, calved after 1st January 1835, shewing the most symmetry and weight—Ten Sovereigns.

WEST HIGHLAND BREED.

XV. For the best Bull, calved between 1st January 1831 and 1st January 1837—Twenty Sovereigns.

For the second best ditto—Ten Sovereigns.

To the *Breeder* of the best Bull in this Class—The Honorary Silver Medal.

It is a condition attached to the Premiums in this Class that the exhibitors shall be obliged to let out, in the season 1839, the Prize Bulls to serve at least forty Cows at such places in the county of Argyll as the Committee shall fix, on payment of Ten Shillings and Sixpence for each Cow. The owner, if resident within the district, to have preference of service for his own stock.

XVI. For the best Bull Stirk, calved after 1st January 1837—Seven Sovereigns.

XVII. For the best Cow, of any age—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

For the third best ditto—Three Sovereigns.

XVIII. For the best two Oxen, calved after 1st January 1834—Ten Sovereigns.

XIX. For the best two ditto—calved after 1st January 1835—Seven Sovereigns.

XX. For the best two ditto, calved after 1st January 1836—Seven Sovereigns.

XXI. For the best two ditto, calved after 1st January 1835, which have not been housed nor confined in a straw-yard since Whitsunday 1836—Seven Sovereigns.

XXII. For the best two Heifers, calved after 1st January 1835—Ten Sovereigns.

XXIII. For the best two ditto, calved after 1st January 1836—Five Sovereigns.

XXIV. For the best five Oxen, calved after 1st January 1837—bred by the exhibitor—Ten Sovereigns.

NOTE.—Exhibitors of the West Highland Stock are referred to the Premium of the Gold Medal, offered for the Experiment referred to in the class of Essays, No. 6, p. 16.

GALLOWAY, POLLED ANGUS, AND POLLED ABERDEENSHIRE BREEDS.

XXV. For the best Ox of the Galloway breed, calved after the 1st of January 1834—Ten Sovereigns.

XXVI. For the best Angus Ox of the same age—Ten Sovereigns.

XXVII. For the best Aberdeenshire Ox of the same age—Ten Sovereigns.

CROSSES.

XXVIII. For the best Ox, first cross of the short-horn, with Ayrshire, Galloway, Fife, West Highland, Aberdeen or Angus stock, the particulars of the cross being specified, calved after 1st January 1834, shewing most symmetry and weight—Ten Sovereigns.

XXIX. For the best ditto, not exceeding 36 months old—Ten Sovereigns.

ANY BREED.

XXX. For the best Ox, calved after 1st January 1834, the particulars of the breed and age being specified—Ten Sovereigns.

§ II. HORSES.

CLASS I. For the best Stallion for the improvement of the breed of Draught Horses, not under three and not exceeding eight years and five months old—Thirty Sovereigns.

Evidence must be produced that the Prize Horse has had produce, and it is a condition attached to the Premium, that the exhibitor shall be obliged to let out the Prize Horse for season 1839, to serve within such portion and at such places of the counties of Lanark, Renfrew, and Dumbarton, as the Local Committee may fix. The number of Mares to be served not to exceed seventy, and the charge to be One Sovereign for each. Ten of the Mares exhibited at the Show, to be recommended by the Judges, to have a preference of service.

For the second best Stallion—Fifteen Sovereigns.

II. For the best Breeding Mare for Agricultural purposes, not exceeding twelve years old, and having had at least one foal—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

III. For the best entire Colt, for Agricultural purposes, rising three years old—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

IV. For the best Filly, for Agricultural purposes, not exceeding thirty-four months old—Five Sovereigns.

§ III. SHEEP.

BLACK-FACED BREED.

CLASS I. For the best two Tups, not exceeding forty-five months old—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

II. For the best pen of five Ewes, not exceeding five years and seven months old, selected from a regular breeding stock of not fewer than a hundred, and the pen having reared Lambs for the season to the 1st of July—Five Sovereigns.

III. For the best pen of five Gimmers—Five Sovereigns.

IV. For the best pen of five Dinmonts—Five Sovereigns.

V. For the best pen of five Wedder Sheep, not under one year and eight months, and not exceeding three years old—Five Sovereigns.

VI. For the best pen of five Wedders, not exceeding three years old, fed exclusively on hill pasture since twelve months old—Five Sovereigns.

VII. For the best pen of five Wedders, four years old, fed on hill pasture since twelve months old—Five Sovereigns.

VIII. For the best pen of five Wedders, of any age, shewing most symmetry, fat, and weight—Five Sovereigns.

CHEVIOT BREED.

IX. For the best two Tups, not exceeding forty-five months old—Five Sovereigns.

X. For the best pen of Five Ewes, not exceeding five years and seven months old—Five Sovereigns.

XI. For the best pen of five Gimmers—Five Sovereigns.

XII. For the best pen of five Dinmonts—Five Sovereigns.

LEICESTER BREED.

XIII. For the best Tup, not exceeding forty-five months old—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

XIV. For the best pen of three Ewes of any age—Five Sovereigns.

XV. For the best pen of three Wedders, not exceeding thirty-two months old—Three Sovereigns.

XVI. For the best pen of three Wedder Lambs—Three Sovereigns.

XVII. For the best pen of three Ewe Lambs—Three Sovereigns.

CROSS BREED.

XVIII. For the best pen of three three-year-old Wedders, a cross between the Black-faced and Cheviot breeds, shewing most symmetry and weight—Five Sovereigns.

XIX. For the best pen of three Dinmonts, not exceeding twenty months old, of the same cross—Five Sovereigns.

XX. For the best pen of three Wedders, a cross between Leicester Tups and Cheviot Ewes—Three Sovereigns.

XXI. For the best pen of three Wedders of any age, a cross between the Leicester and Black-faced breeds, and shewing most symmetry and weight—Five Sovereigns.

XXII. For the best pen of three Wedders, any cross, if not exceeding four years and seven months old, the cross to be specified in the certificate—Five Sovereigns.

XXIII. For the best pen of five Lambs, of any cross with Black-faced Ewes, the cross being specified, which shall be of the greatest value to the butcher on the day of competition—Five Sovereigns.

For the second best ditto—Three Sovereigns.

XXIV. For the best pen of five Lambs, of any cross, which shall be of greatest value to the butcher on the day of competition, the cross to be specified—Five Sovereigns.

§ IV. SWINE.

CLASS I. For the best Boar—Five Sovereigns.

For the second best ditto—Three Sovereigns.

II. For the best Sow—Five Sovereigns.

For the second best ditto—Three Sovereigns.

III. For the best three Pigs, not exceeding forty weeks old—
Five Sovereigns.

For the second best three ditto—Three Sovereigns.

In awarding these Premiums, attention will be paid to the breeds most suitable for family use. The name of the breed to be specified in the Certificate.

§ V. EXTRA STOCK, IMPLEMENTS, ROOTS, AND SEEDS.

For Extra Stock of any kind not shewn for any of the above Premiums, and not exceeding in one lot, five Cattle or ten Sheep, and for Implements, Roots, Seeds, &c., Premiums will be awarded and apportioned by the Committee and Judges, in Money, Plate, or Honorary Medals, to the value in whole of not less than Fifty Sovereigns.

§ VI. WOOL.

CLASS I. For the best sample of Combing Wool of seven fleeces,
—Five Sovereigns.

II. For the best ditto of Short Wool, of the Cheviot breed, of seven fleeces—Five Sovereigns.

III. For the best ditto of Wool of the Black-faced breed, of seven fleeces—Five Sovereigns.

Competitors for these Premiums are required to state the number of sheep of which the flock consisted, from which the sample is taken, the gross quantity clipped, whether the fleeces are ewe or hog, and, if sold, the price obtained; and in regard to the combing wool, whether it is of the New Leicester, Cotswold, or any cross of these breeds. The Exhibitors must have bred the stock from which the wool has been obtained.

§ VII. PRODUCTS OF LIVE-STOCK.

1. CURING BUTTER.

CLASS I. To the owner of any Dairy in the counties of Lanark, Renfrew, Dumbarton, or Argyll, who shall have made and cured, and shall exhibit at the Show, the best quality of butter for the market; the quantity made not being less than two cwt., during the season 1838—Five Sovereigns.

For the second best quality—Three Sovereigns.

A declaration must be lodged with the Secretary, by the party competing, that the sample produced is a fair average of the quality made and cured by the competitors, during the season 1838.

2. MAKING CHEESE.

II. To the person in the counties of Lanark, Renfrew, Dumbarton, or Argyll, who shall produce the best specimen of sweet or full milk Cheese, made of any variety that he finds most profitable for the market, the quantity not being less than one cwt., of 112 lb., 16 oz. to the lb.—Five Sovereigns.

For the second best quality—Three Sovereigns.

The whole quantity of the variety of cheese produced, made by each competitor during the season, must not be less than one cwt., and a declaration must be lodged that two or more cheeses produced are a fair average of the kind competing made in that year by the competitor.

III. To the owner of any Dairy in the counties of Lanark, Renfrew, Dumbarton, or Argyll, who shall have made for sale the best quality of Cheese from skimmed milk, not being less than one cwt., during the season 1838—Five Sovereigns.

For the second best quality of ditto—Three Sovereigns.

These Premiums are offered under the same conditions as the Premiums in Class II.

In the event of two or more lots of Butter or Cheese being deemed of equal merit, the Premiums will be awarded to the greater quantity.

GENERAL REGULATIONS FOR THE SHOW AT GLASGOW.

1. The competition will take place at Glasgow in the end of September or beginning of October 1838. The particular day will be afterwards intimated.

2. The Competition is open to Stock from any part of the United Kingdom.

3. The name, residence, and post-town of the Exhibitor, the name of the Breed, the number of the class in which the animals are to be exhibited, their age, and, in the case of Fat Stock, the kind of food on which they have been fed, must be regularly certified, and the certificate signed by the Exhibitor, agreeably to the form annexed, must be duly lodged fourteen days before the day of Exhibition. The pedigree of the Stock, so far as known, must also be given. A list of the stock entered will be made up by the Secretary fourteen days before the Show, and no Stock will be allowed to compete which is not included in that list.—*Printed forms* of certificates may be had by application at the Society's Hall, Edinburgh; or at Dr Cleland, or Mungo Campbell, Esq. Glasgow.

The Secretary, or his Clerk, will be at Glasgow sixteen days before the Show, to answer inquiries, attend to details, and to receive certificates. In the mean time, certificates may be lodged with him at Edinburgh, or with Dr Cleland or Mr Campbell at Glasgow. The certificates so lodged, are not to be communicated to third parties, until after they have been officially laid before the Committee by the Secretary.

4. A responsible person on the part of the Exhibitor, must attend at the Secretary's Office, at Glasgow, *on or before* the day preceding the Show, at *two o'clock afternoon*, to give explanation, if it should be required, to receive orders or warrants of admission for the Stock of which they are in charge, and all necessary instructions in matters of detail, at the competition. The person or persons so attending must be acquainted with the various particulars required to be certified regarding the Stock of which they are in charge, more especially the mode of feeding in the case of Fat Stock; and it shall be competent to the Committee, if they shall see fit, to require the Exhibitor, or the person in charge of the Stock, to confirm the certificates in presence of a magistrate on the day of competition.

5. In estimating the ages above prescribed for competing Stock, the following rules are to be observed, viz.—The age of Cattle, in all the Classes, will be calculated from the 1st of January of the year in which they were calved; of Horses from the 1st of May of the year in which they were foaled; and of Sheep from 1st of March of the year in which they were lambed.

6. It is required that the Stock shall have been *bona fide* the property and in possession of the Exhibitor from 1st May 1838. Evidence must be produced, if desired, that the Stallions and Bulls for which Premiums are awarded, have had produce during the preceding year; provided they are four years old and upwards.

7. Cattle fed on distillery or brewers' wash or grains, will not be admitted to compete, as such food is not generally accessible to Competitors. From this restriction, the classes 7, 10, 11, and 12, are, however, specially excepted, the Premiums in these classes of Dairy Stock having been offered at the request of a Local Association, and the restriction in reference to these four classes has not been insisted in, at the desire of the parties who have afforded the funds for these Premiums; the restrictions being also, perhaps, the less necessary in the vicinity of a populous city, as many of the Competitors will have access to supplies of the food in question. Cattle fed on oil or rape cake are not excluded in any class. Cows exhibited for premiums must have had a calf, or be in calf, during the year 1838. Cows of the West Highland breed must have suckled or fed a calf that season.

8. A ticket or order will be delivered by the Secretary on or before the day preceding the Show to the person in charge of each lot, for its being received into the Show-Yard; and no Stock whatever can come within the premises without such warrant. One servant only for each lot can be admitted, who must afterwards continue in charge of that lot in the Show-Yard. Bulls must be secured by a ring or screw in the nose, with a chain or rope attached, otherwise they cannot be admitted into the Show-Yard. There are screws for temporary use, which competitors will find it convenient to provide for bulls that have not been usually ringed.

9. The distance each animal travels to the Show, and, in the case of Fat Stock, the date of being put to fatten, to be mentioned.

10. A competitor may shew more than one lot in any class. It shall not be competent to enter a lot in one Class, and afterwards to withdraw it for competition in another Class, unless by directions of the Committee. An animal having already gained the first premium in his Class, at any of the Society's General Shows of Stock, which have been held at Edinburgh, Glasgow, Perth, Dumfries, Inverness, Kelso, Stirling, Aberdeen, or Ayr, is not to be shewn again in competition in the same Class, but may be exhibited as Extra Stock.

11. All persons intending to exhibit Extra Stock, must intimate to the Secretary, and describe the Stock, fourteen days before the exhibition. Stock which

cannot be shewn in any competing Class, may be exhibited as Extra Stock. If any lot of Fat Stock, for which a competing Class is open, is to be entered as Extra Stock, from an impression on the part of the Exhibitor that they are too young to compete in the Classes open to them, the Judges of Extra Stock are directed to notice them specially, provided they possess merit.

12. The competing Stock will be classed and distinguished by *Tickets or Numbers* to be affixed to each Lot, immediately after they are placed in the Show-Yard, corresponding to the list made up by the Secretary;—by this arrangement the owner's name is not known to the Judges.

13. The Committee of the Society appointed to conduct the arrangements for the Show will appoint skilful persons to act as Judges. These will be divided into sections, to judge of the Breeds and Stock with which they are best acquainted, and in order to render the inspection short, so as the public may be permitted to enter the Show Yard as early as possible. The Judges, in forming their opinion, will particularly attend to the instructions to be delivered for their guidance.

14. A Member of the Committee, or of the Deputation of Directors, will be appointed to attend each section of the Judges, and who, along with the Judges, shall be admitted into the Show-Yard, at ten o'clock precisely. A servant, provided with Tickets, upon which shall be written in legible characters, "First Premium," or "Second Premium," will be in attendance on the Member of the Committee so appointed. The Judges shall immediately proceed to examine and decide on the merits of the Stock; and as soon as a Section shall determine which animal or animals are entitled to the Prizes in their respective Classes, the Member of the Committee or Deputation of the Directors shall forthwith direct the servant in attendance to affix the prize-ticket on the animal, and the Member of the Committee or Deputation is to be responsible that they are labelled accordingly, in order that the public may have the earliest opportunity to examine the points of the Prize Cattle. When the inspection is finished, the Judges shall sign and give in their Reports to the Committee, and their award shall be final, provided no valid objection is stated against the Prize animals' right to compete in their respective Classes.

15. To prevent confusion, and to afford the time necessary for placing the Stock in the Show-Yard, the different lots must be brought to the ground at or before eight o'clock in the morning. On their arrival at the gate, instructions will be given as to the particular part of the Show-Yard to be occupied by each Class. The Stock will be withdrawn, and the Show-Yard shut at four o'clock.

16. Persons intending to exhibit Implements, Roots, or Seeds, must communicate with the Secretary, and lodge with him a memorandum descriptive of the articles to be shewn, at least five days before the meeting.

Finally, no change can, under any circumstances, be made upon the General Regulations established by the Society for Agricultural Meetings and General Shows of Live-Stock, so far as Competitors are interested, unless regularly submitted and approved at a meeting of the Directors in Edinburgh, and duly intimated to Competitors.

His Grace the Duke of Sutherland, the President of the Society; and the Most Noble the Vice-Presidents, the Lord-Lieutenants, Vice-Lieutenants, and Conventors of the Counties, with an adequate number of the Members of the Society, to be named at the meetings on the 30th April, by the four counties more immediately connected with the Show, and by the City of Glasgow, together with the Secretaries of the Local Agricultural Associations, have been appointed a Committee for regulating all details connected with the Agricultural Meeting and General Show

of Live Stock at Glasgow. The Right Honourable Lord Belhaven, in his absence, Mungo Nutter Campbell, Esq. of Ballimore, to be Convener of the Committee.

A deputation of the Directors of the Society will be at Glasgow two days before the meeting.

FORM OF CERTIFICATE BEFORE REFERRED TO AS APPLICABLE TO
FAT OXEN.

I near the post-town of , in the county of , do certify, That my Ox, (or Oxen as the case may be) of the breed to be shewn at the General Show of Live-Stock at Glasgow, for the Premium in class was bred by Mr of ; he was calved after 1st January 18 , and is now years and months old, and was fed by me on . He has not at any time been fed on distillery or brewers' wash or grains. He will have to travel on foot (or by steam or other conveyance as the case may be) miles or thereby, from the place of feeding to the Show at Glasgow. He was first put up to fatten on or about the day of . Witness my hand this day of 1838.

(Signature of the Exhibitor.)

Any observations as to the animal's appearance, and state of flesh when put up to feed, or other particulars which the Exhibitor may think material, and more especially the pedigree, may be subjoined to the above certificate. The certificates for Breeding Stock, and for Horses, Sheep, and Pigs, will be varied in conformity to the regulations applicable to these descriptions of Stock.

If the lot has not been bred by the Exhibitor, it is particularly desired that the Breeder, if known, may be mentioned.

INSTRUCTIONS TO THE JUDGES.

1. Upon their arrival in the Show-Yard, the Judges will assemble in the apartment provided for their accommodation, until it is intimated to them that all arrangements, preparatory to their proceeding to view the Stock, are completed.

2. Without inquiry as to the names of parties or places, the Judges are to determine by reference to the *numbers* affixed to each lot by the Secretary. The Judges, in their report, will name not only those animals entitled to the Premiums, but also the others in each class which they may consider most worthy of notice.

3. The Secretary is understood to have satisfied the Committee of the regularity and correctness of the Certificates lodged, before granting the warrant for Exhibition; and the Judges, therefore, must proceed upon that evidence, without reference to any other person. They will state, however, for the information of the Committee, if any of the Stock, in their opinion, does not come within the regulations prescribed for the Competition, so that such farther inquiry may be made as the Committee may think necessary.

4. In forming their judgment, the Judges will have regard to the symmetry, early maturity, purity, size, and general qualities, characteristic of the different breeds they have to judge of; making due allowance for age, feeding, and circumstances peculiar to the cases which come before them. They shall not award Premiums for Cows, Bulls, or Heifers, which shall appear to have been fattened for the butcher, the object being to have superior animals of these descriptions, for the purpose of breeding.

5. In no case shall a Premium be adjudged unless the Judges shall deem the Lot to have *sufficient merit*; more especially if one Lot only is presented for any of the Premiums.

6. Having formed their opinion, the Judges will sign and deliver their Report; and, having done so, they are not afterwards to propose any change. In the event of a difference of opinion, the majority shall be conclusive. When the signed Report is delivered over to the Committee, the duty of the Judges shall cease, and it will devolve on the Committee finally to award the Premiums.

CLASS XII.

GENERAL SHOW OF LIVE STOCK,

AND

AGRICULTURAL MEETING AT INVERNESS IN 1839.

The Society having resolved to hold the General Show of Live-Stock and Agricultural Meeting for 1839, at Inverness, the following Premiums are offered to be then awarded, aided by liberal donations from the town and county of Inverness, and adjoining counties.

§ I. CATTLE.

WEST HIGHLAND BREED.

I. For the best Bull, calved between 1st January 1833 and 1st January 1837—Twenty Sovereigns.

For the Second best ditto—Ten Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

It is a condition attached to the Premiums in this class, that the Exhibitors shall be obliged to let out, in the season 1840, the Prize Bulls, to serve at least forty Cows, at such places in the Districts more immediately connected with the Show, as the Committee shall fix, on payment of Five Shillings for each Cow. The owner, if resident within the District, to have preference of service for his own stock.

II. For the best Bull, calved after 1st January 1837—Seven Sovereigns.

III. For the best two Heifers, calved after the 1st January 1837—Five Sovereigns.

IV. For the best Breeding Cow, calved between 1st January 1831 and 1st January 1835—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

For the third best ditto—Three Sovereigns.

V. For the best two Oxen, calved after 1st January 1835—Ten Sovereigns, or Plate of that value.

VI. For the best two Oxen, calved after 1st January 1836—Seven Sovereigns, or Plate of that value.

VII. For the best two Oxen, calved after 1st January 1836, which have never been housed nor confined in a straw-yard—Ten Sovereigns.

VIII. For the best lot of Stot Stirks, not fewer than six, calved after 1st January 1838, bred by the Exhibitor—Seven Sovereigns.

IX. For the best lot of six Queys, calved after 1st January 1838, bred by the Exhibitor—Seven Sovereigns.

SHORT-HORN BREED.

X. For the best Bull of the pure short-horn breed, calved after 1st January 1832—Twenty Sovereigns.

For the second best ditto—Ten Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

A similar condition is attached to the Premiums in class 10, as above intimated for Class 1. Ten Shillings and Sixpence to be paid for each cow.

XI. For the best Bull Stirk, calved after the 1st of January 1838—Seven Sovereigns.

XII. For the best Heifer, calved after the 1st of January 1838—Five Sovereigns.

XIII. For the best Cow of any age—Ten Sovereigns.

XIV. For the best Cow, calved after 1st January 1835—Eight Sovereigns.

For the second best ditto—Five Sovereigns.

XV. For the best Ox of the same breed, calved after 1st January 1837, bred by the Exhibitor—Seven Sovereigns.

XVI. For the best two Heifers, calved after 1st January 1837—Seven Sovereigns.

ABERDEEN, ANGUS, AND GALLOWAY POLLED BREEDS.

XVII. For the best Bull, calved between 1st January 1832 and 1st January 1837—Twenty Sovereigns.

For the second best ditto—Ten Sovereigns.

For the third best ditto—Five Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

A similar condition is attached to the Premiums in class 17, as above intimated for class 1.

XVIII. For the best Bull calved after the 1st January 1837—Seven Sovereigns.

XIX. For the best Cow of this breed, calved between 1st January 1831 and 1st January 1836—Ten Sovereigns.

For the second best Cow—Five Sovereigns.

XX. For the best two Heifers, calved after 1st January 1836—Seven Sovereigns.

XXI. For the best two ditto, calved after 1st January 1837—Five Sovereigns.

XXII. For the best two Oxen, calved after 1st January 1835—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

AYRSHIRE BREED.

XXIII. For the best Bull, calved between 1st January 1832 and 1st January 1837—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

A similar condition is attached to the Premiums in class 23, as above intimated for class 1.

XXIV. For the best Bull calved after 1st January 1837—Five Sovereigns.

XXV. For the best two Heifers, calved after 1st January 1837—Five Sovereigns.

XXVI. For the best Cow, calved after 1st January 1831—Seven Sovereigns.

For the second best ditto—Five Sovereigns.

ANY BREED.

XXVII. For the best pair of fat Oxen, of any breed except the Short-horn, calved after 1st January 1835—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

CROSSES.

XXVIII. For the best two Oxen, a first-cross between a short-horn Bull and an Aberdeenshire horned Cow, calved after 1st January 1837—Five Sovereigns.

XXIX. For the best two ditto, calved after 1st January 1836—Five Sovereigns.

XXX. For the best two Oxen, a first cross between a Bull of the short-horn breed and an Aberdeenshire polled Cow, Angus polled Cow, or Galloway polled Cow, calved after 1st January 1837—Five Sovereigns.

XXXI. For the best two ditto, calved after 1st January 1836—Five Sovereigns.

§ II. HORSES.

CLASS I. For the best entire Horse for agricultural purposes, not under five years, and not exceeding eight years and six months old, bringing evidence of having had produce in the former year—Twenty-five Sovereigns, or Plate of that value.

For the second best ditto—Fifteen Sovereigns.

II. For the best entire Colt for agricultural purposes, not exceeding four years and six months old—Ten Sovereigns.

Evidence must be produced that the Prize Horses in these two Classes have had produce, and it is a condition attached to the Premiums that the Exhibitors shall be obliged to let out the Prize Horses for season 1840, to serve within such portion and at such places of the Districts as the Local Committee may fix. The number of Mares to be served by each horse not to exceed seventy, and the charge to be One Sovereign for each Mare.

III. For the best Breeding Mare for agricultural purposes, having had at least one Foal, and not being under five nor exceeding twelve years and six months old—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

IV. For the best three-year-old Filly for agricultural purposes—Five Sovereigns.

V. For the best two-year-old ditto—Five Sovereigns.

VI. For the best Highland entire Pony, not exceeding fourteen and a half hands high—Ten Sovereigns, or Plate of that value.

VII. For the best Highland Breeding Mare, not exceeding thirteen hands high—Seven Sovereigns.

VIII. For the best Highland Pony for the Saddle, not under four and not exceeding seven years and six months old, and not more than thirteen hands high—Five Sovereigns.

IX. For the best pair of three-year-old Colts, said breed, for agricultural purposes—Ten Sovereigns.

X. For the best Pony Mare, or Highland Garron, not under thirteen and a half hands, and not exceeding fourteen and a half hands high—Five Sovereigns.

§ III. SHEEP.

BLACK-FACED BREED.

CLASS I. For the best two Tups, not exceeding 45 months, which shall have served a hirsle of Ewes in Autum 1838—Seven Sovereigns.

For the second best two ditto—Five Sovereigns.

II. For the best pen of five Ewes, not exceeding five years and seven months old, selected from a hirsle of a regular breeding stock, not less than 200, and the pen having reared lambs for the season—Six Sovereigns.

For the second best pen of ditto—Five Sovereigns.

III. For the best pen of five Wedders, not exceeding five years and seven months old—Five Sovereigns.

CHEVIOT BREED.

IV. For the best two Tups, not exceeding forty-five months old, and which have served with a hirsle in the autumn of 1838—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

V. For the best pen of five Ewes, not exceeding five years and eight months old, and which have reared Lambs for the season—Seven Sovereigns.

For the second best pen of five ditto—Five Sovereigns.

VI. For the best pen of five Gimmers—Five Sovereigns.

VII. For the best pen of five Wedders, not exceeding four years and eight months old, shewing symmetry, fat, and weight—Five Sovereigns.

For the second best ditto—Three Sovereigns.

VIII. For the best pen of five fat Wedders, not exceeding three years and eight months—Five Sovereigns.

LEICESTER BREED.

IX. For the best Tup, not exceeding four years old—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

X. For the best Shearling Tup—Five Sovereigns.

XI. For the best pen of three Ewes, not exceeding three years and eight months old, and having reared Lambs for the season—Seven Sovereigns.

For the second best ditto—Five Sovereigns.

SOUTHDOWN BREED.

XII. For the best Tup, not exceeding four years old—Ten Sovereigns.

XIII. For the best pen of three Ewes, not exceeding three years and eight months old—Seven Sovereigns.

CROSSES.

XIV. For the best pen of five Wedders, cross between Leicester Tups, and Cheviot Ewes, not exceeding three years and eight months—Five Sovereigns.

XV. For the best pen of five Wedders, cross between Leicester Tups and Black-faced Ewes, not exceeding three years and eight months old—Five Sovereigns.

XVI. For the best pen of five Widders, first cross between Cheviot Tups and Black-faced Ewes, not exceeding three years and eight months old—Five Sovereigns.

XVII. For the best pen of five Widders of any cross, not exceeding thirty-two months old—Five Sovereigns.

§ IV. SWINE.

CLASS I. For the best Boar—Five Sovereigns.

For the second best ditto—Three Sovereigns.

II. For the best Sow—Five Sovereigns.

For the second best ditto—Three Sovereigns

III. For the best three Pigs, not exceeding forty weeks old—Five Sovereigns.

For the second best do—Three Sovereigns.

NOTE.—In awarding these Premiums, attention will be paid to the Breeds most suitable for family use. The name of the Breed to be specified in the Certificate.

§ V. WOOL.

CLASS I. For the best sample of Leicester Wool, shewn by the Breeder of the Stock, not fewer than seven fleeces—Five Sovereigns.

II. For the best sample of Cheviot Laid Wool, shewn by the Breeder of the Stock, not fewer than seven fleeces—Five Sovereigns.

III. For the best sample of Black-faced Laid Wool, shewn by the Breeder of the Stock, not fewer than seven fleeces—Five Sovereigns.

IV. For the best sample of Wool, cross between Cheviot and Black-faced, shewn by the Breeder of the Stock, not fewer than seven fleeces—Five Sovereigns.

Competitors for these Premiums are required to state the number of sheep of which the flock consisted, from which the sample is taken, the gross quantity clipped, whether the fleeces are ewe or hog, and, if sold, the price obtained; and, in regard to the combing wool, whether it is of the New Leicester, Cotswold, or any cross of these breeds. The exhibitors must have bred the stock from which the wool has been obtained.

§ VI. EXTRA STOCK, IMPLEMENTS, ROOTS, AND SEEDS.

For Extra Stock of any kind, not shewn for any of the above premiums, and not exceeding in one lot five Cattle or ten Sheep, and for Implements, Roots, Seeds, &c. premiums will be awarded and apportioned, by the Committee and Judges, in Money, Plate, or Honorary Medals, to the value in whole of Fifty Sovereigns.

GENERAL REGULATIONS FOR THE SHOW AT INVERNESS.

1. The Competition will take place at Inverness in the end of September, or beginning of October 1839. The particular day will be afterwards intimated. The Competition will be open to Stock from any part of the United Kingdom.

2. The name, residence, and post-town of the Exhibitor, the name of the Breed, the number of the Class in which the animals are to be exhibited, their age, and, in the case of Fat Stock, the kind of food on which they have been fed, must be regularly certified. Forms of the necessary Certificates, and information as to the period when they fall to be lodged, will in due time be furnished.

3. In estimating the ages above prescribed for competing Stock, the following rules are to be observed, viz.—The age of Cattle, in all the Classes, will be calculated from the 1st of January of the year in which they were calved; of Horses from the 1st of May of the year in which they were foaled; and of Sheep from the 1st of March of the year in which they were lambed.

4. It is required that the Stock shall have been *bona fide* the property and in possession of the Exhibitor, from 1st May of the year in which the Show is to be held. Evidence must be produced, ~~if~~ desired, that the Stallions and Bulls for which Premiums are awarded have had produce during the preceding year; provided they are four years old and upwards.

5. No Cattle fed on distillery or brewers' wash or grains (which are accessible to a few competitors only,) will be allowed to compete. Cows exhibited for Premiums must have had a calf, or be in calf, during the year of the Show.

6. The distance each animal travels to the Show, and, in the case of Fat Stock, the date of being put to fatten to be mentioned.

7. A Competitor may show more than one Lot in any Class. It shall not be competent to enter a Lot in one Class and afterwards to withdraw it for competition in another Class, unless by directions of the Committee. An animal having already gained the first premium in his Class, at any of the Society's General Shows of Stock, which have been held at Edinburgh, Glasgow, Perth, Dumfries, Inverness, Kelso, Stirling, Aberdeen, or Ayr, is not to be shown again in competition in the same Class, but may be exhibited as Extra Stock.

8. Stock which cannot be shown in any competing Class may be exhibited as Extra Stock. If any Lot of Fat Stock, for which a competing Class is open, is to be entered as Extra Stock, from an impression on the part of the Exhibitor that they are too young to compete in the Classes open to them, the Judges of Extra Stock will be directed to notice them specially, provided they possess merit.

9. The Judges will be instructed not to award premiums to Cows, Bulls, or other breeding Stock which shall appear to have been fattened for the butcher—the object being to encourage such Stock for the purpose of breeding.

10. The Bulls and Stallions for which Premiums are awarded, shall be bound to serve in the district more immediately connected with the Show during the season 1840, the rates and places to be fixed by the Committee in charge of the Show.

11. The other Regulations referable to General Shows will be published in due time for the information of Competitors. In the mean time, intending Competitors are referred to those published for the Glasgow Meeting for 1832.

THE VETERINARY SCHOOL.

The Establishment is now in its Fourteenth Session, under the Lecturer appointed by the Society, Mr Dick, a Graduate of the Veterinary College of London.—Students receive instruction in the anatomy and diseases of the horse, and other domestic animals, in the best system of treatment and cure, in stable management, and in the most approved and scientific modes of shoeing. The students are sent to the class by Local Agricultural Associations, or attend on their own account. The hour of Lecture is accommodated to the convenience of students attending the Agricultural and other classes in the University. Those students who attend two courses, and are afterwards found qualified at the annual Examination by the Committee of Medical Examinators, receive Certificates.

Mr Dick occasionally delivers a popular course of Lectures to a class of gentlemen. It may be also observed, that several of the principal Lecturers in different branches of Medical Science, have for some years given free admission to their classes, to those Veterinary Students who intend to practise.

The Lectures and Demonstrations for the Session 1838-9, will be commenced in November next, at the Lecture-room in Clyde Street, Edinburgh.

SPECIMENS OF THE DIFFERENT QUARRIES AND MINES OF SCOTLAND.

The Society, considering it to be a very important step towards the attainment of a Geological and Mineralogical Survey of Scotland,—and a measure otherwise of general utility and interest,—that the nature of the Rocks and other Mineral produce should be ascertained with certainty and precision, by the collection of a complete series of specimens, to be deposited and topographically arranged for reference in its Museum, would esteem it not only as a favour to the Society, but as a public benefit to the country, if the proprietors of estates, or the owners or lessees of the quarries or mines, worked in Scotland, will cause specimens of the different Rock-formations, Ores, and other Mineral productions of their respective districts, to be transmitted accordingly to the Society's Museum, Edinburgh.

These specimens need not be more than three inches square, and one and a half or two inches at most in thickness ; and it is desirable that each package should be accompanied by the donor's name, and a short account of the locality of the quarry or mine from which the specimens have been taken ; together with a descriptive catalogue of the specimens transmitted, each of which must have the corresponding name or number pasted upon it. If several varieties of stone, &c. are seen in the same quarry, specimens of each should be sent, numbered according to their order of succession, marking the uppermost No. 1, and thence descending in regular order with Nos. 2, 3, 4, &c. ; and their exact positions may be shown by a rough sketch or diagram in this form.

~~~~~	Soil.
No. 1.	Shale
2.	Sandstone.
3.	Coal.
4.	Sandstone
5.	Shale
6.	Coal.
7.	Shale.
8.	Limestone.

Packages to be addressed to the care of Mr Slight, Curator of the Museum, at the Society's Hall.

NOTE.—The local Associations that may have been formed in different parts of the country for the encouragement of the study of Natural History, may render themselves of the greatest service in forwarding a work of so much national importance, by directing and superintending the collection and transmission of these specimens, as far as their influence may extend in the districts with which they may be respectively concerned. Any communications from them on the subject, addressed to the Secretary, will be thankfully acknowledged.

By Order of the Directors,

CHARLES GORDON, *Secretary.*

# PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL  
SOCIETY OF SCOTLAND,

FOR PROMOTING

AGRICULTURE AND INTERNAL IMPROVEMENT  
IN SCOTLAND,

IN

*1839.*

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## PRELIMINARY NOTICE.

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The business of THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND is conducted by a President, Four Vice-Presidents, Thirty Ordinary, and Ten Extraordinary Directors, a Treasurer, an Honorary Secretary, and a Secretary, to which last all communications are addressed. The Ordinary Directors are subdivided into Committees for the dispatch of business, assisted occasionally by those Ordinary Members most conversant with the subjects to be discussed. The Report of each Committee is brought before the Directors collectively for farther procedure, and these proceedings are again submitted for approbation to a half-yearly General Meeting of the Society. One of the General Meetings is, by the Charter, appointed to be holden on the second Tuesday of January; the other on such lawful day in the months of June or July as the Directors may fix. New Members are admitted at either of these General Meetings by ballot. They pay a small annual contribution of £1:3:6, or, in their option, and in full of all future claims, a life subscription of Twelve Guineas. The annual Subscription is payable in advance, and is expected to be so paid or remitted, by the Members who are liable in it, without expense to the Society. All Meetings of Directors, or Committees, are open; and at these any member may attend and deliver his opinion on the subjects under consideration, though, in cases of division, the Directors or Members of the Committees only are entitled to vote. Members have access to the Society's Library, which is annually increasing, by the purchase or donation of books connected with the purposes of the Institution.

When the Highland and Agricultural Society of Scotland was instituted in the year 1784, the object chiefly contemplated was the improvement of the Highlands, and hence the name—THE HIGHLAND SOCIETY OF SCOTLAND—which it then assumed. But the great increase in the number of its Members since that time, the happy management of its funds, and the change in the general state of the country, have long enabled it to extend the design of its first institution, and direct attention to every part of North Britain where industry might be excited or the useful arts improved. In accordance with this extension of the purposes of its institution, the Society, in the Supplementary Charter lately obtained, has been named THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The Society has, neither by its Charters of Incorporation, nor by its practice, been limited in its patronage to any one department of industry; but it has regarded, as the fitting objects of encouragement, every application of useful labour which might tend to the general good. But although its patronage be thus extended as regards its objects, circumstances have arisen to modify, in some cases, the application of it. The establishment of certain Boards, for the encouragement of the Herring Fishery, and the like, has induced the Society to restrict its original views, and to devote its attention, and apply its funds, in a more special manner, to other objects, and chiefly to Agricultural and Rural Economy in their various branches.

In fulfilment of its purposes, the Society is every year accustomed to offer and award a variety of Premiums, as the means of eliciting and diffusing knowledge

## PRELIMINARY NOTICE.

as incitements to industry, or as the rewards for useful undertakings. These relate to every subject which may be supposed to fall within the plan of the Institution : such are, the Improvement of Waste Lands by Tillage, by Irrigation, or by Draining, the development of the Mineral products of the country, the extension of Plantations, as the objects of ultimate profit, or of present embellishment and shelter,—the improvement of the breeds of Live Stock, and of the qualities of Wool,—the encouragement of certain domestic Manufactures,—and not the least in interest and importance, the awakening the industry of the Lower Ranks to such pursuits as shall promote their content, by ameliorating their condition. A Mechanical Department exists for rewarding the original invention or subsequent improvement of all machines and implements for Agricultural purposes, the construction of those for other branches of Rural Economy, and of some for domestic convenience. Models of these are received and preserved in the Society's Museum ; and descriptions of all such as merit attention are as speedily as possible conveyed to the public.

Although certain subjects be thus selected as the objects of experiment or discussion, the patronage of the Society is not restricted to these objects. Its purposes being the promotion of general industry and improvement, it receives with favour every beneficial communication, and every statement of facts which may admit of an useful application.

The Papers of the Society are printed periodically in "THE QUARTERLY JOURNAL OF AGRICULTURE, AND THE PRIZE-ESSAYS AND TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND," published by Messrs BLACKWOOD of Edinburgh, Mr CADELL of London, and Messrs CURRY & Co. of Dublin.

All communications relating to Premiums, as well as Papers or Reports for publication in the Transactions of the Society, and other subjects for the consideration of the Directors, are to be addressed to Sir CHARLES GORDON, the Secretary of the Society, at the Society's Hall, Albyn Place, Edinburgh.

## NOTICE TO CANDIDATES,

### AND GENERAL RULES FOR COMPETITION.

When subjects are specially selected for competition, it is always to be understood, 1st, That however concisely the subjects themselves be announced, ample information is required concerning them—2d, That this information shall be founded on experience or observation, and not on simple references and quotations from books—3d, That it shall be digested as methodically as possible—and 4th, That Drawings, Specimens, or Models, adapted to a defined scale (3 inches to the foot if convenient), shall accompany writings requiring them for illustration.

Certain conditions are annexed to each of the various subjects of competition, as detailed in the List of Premiums ; and these are rigidly enforced by the Society, as the only means of ensuring regularity in the conduct of the business, and of distributing exact justice among the competitors.

In all Essays for Competition, it is expected that when facts not generally known are stated, they will be authenticated by proper references. Competi-

tors in Essays are not to communicate their names, but shall transmit along with the Essays a sealed note containing their names and addresses, and inscribed on the back with some distinguishing motto or device, which shall also be inscribed on the Essay. When this regulation is neglected, such Essay shall not be received in competition. If the Essayist has formerly gained a Premium from the Society for a paper communicated by him, it is recommended that his subsequent Essay shall be written in a different hand from that of the former successful paper.

None of the sealed notes, except those that bear the distinguishing motto or device of the Essays found entitled to Premiums will be opened, and the sealed note will not in any instance be opened without the consent of the author, unless a Premium equal to at least one half of the sum offered shall have been adjudged. But should no application be made for the papers on or before the 1st of March in each year, it will be held as belonging to the Society on the terms proposed. Such Essays as are not found entitled to any Premium will, with the sealed notes, be returned to the authors, if required. The Society is to be at liberty to publish the Essays, or extracts from them, for which the Premium, or part of it, shall be awarded.

Candidates are requested to observe, that, in any instance, when Essays, Reports, or Certificates are unsatisfactory, the Society is not bound to give the reward offered; and that in certain cases power is reserved of giving such part only of a Premium as the claim may be adjudged to deserve; but competitors may feel assured that the Directors will always be inclined to judge liberally of their several claims.

~~Essays~~ or Reports on subjects for which Premiums have in former years been offered, but not fully competed for, will still be received, although the subjects may now be discontinued on the List, and Honorary awards will be voted when the communications appear to merit them.

Essays and Reports, for which no Premiums have been awarded, must, if desired to be returned, be called for within one year from the date of Competition, otherwise the Society will not be responsible for the papers.

Competitors will understand it as a condition having reference to every Premium and reward offered by the Society, that the decisions of its Committees and Board of Directors, as confirmed by the Society, are to be final and conclusive, and that it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

In all reports of Experiments relating to the Improvement or Management of Land, it is expected that the expenses shall be accurately detailed. When Machines or Models are transmitted, it must be stated whether they have been elsewhere exhibited or described.

In all Premiums offered, having reference to Weight or Measure, the New or Imperial Standards are alone to be understood as referred to; and Competitors are required to state their calculations according to these, the only legal standards, otherwise the claim will not be entertained.

When the Premiums are awarded in Plate, the Society will, in such cases as the Directors may see proper, allow them to be paid in money, on the application of the successful Candidates.

The Premiums awarded by the Society are payable after the 10th February, for the preceding year.

## ESTABLISHMENT FOR 1839.

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## Vice-Presidents,

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 1838. THE RIGHT HONOURABLE ARCHIBALD JOHN, EARL OF ROSEBERRY.  
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ACCORDING TO PRIORITY IN DATE OF ELECTION.

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## Chairmen of Standing Committees, 1839.

*Funds and Accounts*,..... HENRY HOME DRUMMOND, Esq. of Blairdrummond.  
*Publications and Papers*, ... DAVID LOW, Esq. F.R.S.E. Professor of Agriculture.  
*The Agricultural Museum*,... The Marquis of TWEEDDALL, K. T.  
*Mechanics*,..... Sir JOHN ROBISON, K.H. Secretary Royal Soc. Edin.  
*Geology*, ..... DAVID MILNE, Esq. Advocate.  
*The Veterinary School*,.... JOHN BURN MURDOCH, Esq. of Gartincaber.  
*Regulations for General* } ... G. MACMILKIN TORRANCE, Esq. of Kilsaintninian.  
*Shores of Live Stock*, {  
*The Argyll Naval Fund*,..... P. SMALL KEIR, Esq. of Kinmonth.

# PREMIUMS, &c.

*SOCIETY'S HALL, ALBYN PLACE,  
EDINBURGH, 2d February 1839.*

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND does hereby advertise, That the under-mentioned PREMIUMS are to be given by the Society in the Year 1839, &c.

## CLASS I.

### AGRICULTURAL MACHINERY.

#### 1. APPLICATION OF STEAM TO THE CULTIVATION OF THE SOIL.

A Premium of Five Hundred Sovereigns will be awarded for the first successful Application of Steam Power to the Cultivation of the Soil.

By the cultivation of the soil are to be understood the operations of ploughing and harrowing, or preparing the soil in an equally efficient manner, and the other purposes for which animal power is now used; and the success of the invention will be judged of in relation to its applicability to the above purposes in the ordinary situations of farms in this country, and to the saving *in time, labour, and outlay*, which it may possess over animal power, as now generally employed in the cultivation of the soil.

The merits of the invention, with reference to the conditions enumerated, will be judged of by a Committee of the Society specially appointed, and the inventor will be required to exhibit the machinery and modes of applying it in Scotland. The Secretary, on application of intending Competitors, will furnish any information which may be required.

The Society, in offering this Premium, does not feel it to be necessary to express opinions as to the probability of a successful application of steam to tillage, as to the means by which the object may be attained, or as to the effects which might be supposed to result from the application of such a power. But it has felt it to be a duty imposed upon it by its situation, to bring the subject in a proper manner before the country, to encourage those who are now engaged in this class of experiments, and to stimulate future invention by the offer of a premium corresponding, in some measure, to the interest and importance of the subject. Looking to the great extended application which has recently been made of steam as a motive power, and seeing that the difficulties which are opposed to its application to the purposes of the farm have been at least partially overcome by the efforts of individuals, it has appeared to the Society, that, without exciting expectations which may not be realized, a strong ground exists for having this possible application of steam-power made the subject of fair and satisfactory experiment.

## 2. IMPLEMENT FOR CUTTING DRAINS.

The Gold Medal, or a Piece of Plate of that value, will be given for an implement or implements, worked by horses, which shall produce the greatest saving compared with the expense at present incurred by manual labour, in cutting drains, in land where the subsoil is of a retentive nature.

The invention must be original, and specific information given as to the time when the implement was first used.

Models and Descriptions, with certificates of the efficiency of the implement, to be lodged, as after specified, with reference to implements, submitted for the Premium No. 4.

## 3. INVENTION OR IMPROVEMENT OF IMPLEMENTS OF HUSBANDRY.

To the person who shall invent or improve any Instrument or Machine applicable to Husbandry or Rural Economy (other than those above specified), and which, from its utility in saving labour or expense, simplicity, or cheapness of construction, or other circumstances, shall be deemed by the Society deserving of public notice—The Silver Medal, or such sum in Money as the communication shall appear to deserve.

The account of the implement must be accompanied by a model made, when convenient, to a scale of three inches to the foot, to be deposited in the Society's Museum. The model to be formed of wood or metal: and the notice or description transmitted with it must specify, according to the best of the inventor's abilities, the purpose or advantage of his invention or improvement. Models and Descriptions may be lodged at any time with the Secretary.

## CLASS II.

### ESSAYS AND REPORTS ON VARIOUS SUBJECTS.

#### 1. GEOLOGICAL SURVEYS.

Fifty Sovereigns, or a Piece of Plate of that value, will be given to any person who shall, from his own observation, execute the best Geological Survey of any County or District in Scotland, except the following, viz. Berwickshire, the Lower District of Morayshire, Renfrewshire, the North of Ayrshire, the Middle or Lower part of Perthshire, Sutherlandshire, and Fifeshire, which are already reported on.

The author must, to compete for this Premium, himself draw up a written Report or Essay on the Rocks and Soils of the District, and colour Geologically, in the fullest detail that the scale will admit of, a portion of Thomson's Atlas of Scotland (folio edition), corresponding to an extent of surface of not less than 200 square miles, and at the same time send a collection of specimens of rocks to illustrate both the Essay and the Map,—all which must be lodged with the Secretary on or before the 20th of October in any year.

This Report must give a full description of the Geology and Mineralogy of the District represented, accompanied by coloured sections of such portions of it as may appear to require this species of illustration, founded on actual observation,—if in any case the sections should be ideal, it must be so stated. In this Report, the author will be required to explain the classification and subdivision of the different rock formations he may have adopted, and, in general, to communicate every thing of interest or importance that may occur connected with the subject of the survey.

The author will be expected to have paid particular attention to the Topography of the District included in the survey, so as to be able to point out any errors or omissions he may have de-

tected in the Map; or should he be able to procure a better survey of the district he is describing than that in Thomson's series of Maps, he will be permitted to avail himself of it, provided it is on a scale equally suited to the purpose.

The author is farther invited to direct his attention to the Soils of the District, so as to describe the ingredients of which they are composed, and whether they have been formed by the disintegration of the subjacent rocks, or have been transported from distant parts. Where the soil has been brought from a distance, the authors will state the quarters from which it appears to have been brought, as well as the boulders that occur in the soil, or are strowed over the district. It is necessary also, that the author should show the connection between the agriculture of the district and its rocks and soils, in reference to their influence on the pastures, crops, and timber of the district. Authors, in describing the country, must also notice any remarkable or interesting spring waters, particularly in respect to their temperature, and to the medicinal or other properties they may appear to possess. If not already sufficiently known, a chemical analysis of such waters as may be considered likely to be of importance, must accompany the Report. The Report, Map, Sections, and Specimens of the different Rocks referred to in the Report are, in the event of the author being found entitled to a Premium, to be the property of the Society.

Farther, for Geological Surveys deemed worthy of distinction, but which may not be found entitled to the principal Premium in the year in which they are lodged, the Society's Gold or Silver Medal will be awarded to the authors. And, in order to hold out every encouragement to geologists to assist the Society in the important object of completing Geological Surveys of the various districts of Scotland, it has been resolved, that should any survey not obtain a Premium in the year in which it is transmitted, the author shall be entitled to amend it by farther observation, and to bring it forward for competition in a future year.

The Surveys in competition for this Premium in 1839, to be lodged on or before the 20th of October next, under the conditions on pages 5 and 6.

NOTE.—Two Hundred Square Miles being the smallest extent for which the above Premiums are, under any circumstances, to be awarded, will only be considered sufficient in cases in which the Competitors shall have selected for the subjects of their Surveys and Reports, those districts which, from the variety or the complexity of the geological formations, and the importance of the mineral resources they contain,

possess the greatest degree of public interest, and, at the same time, require the most time, labour, and talent, to describe with the minuteness and accuracy expected.

It must, therefore, be distinctly understood, that the Maps and descriptions of less interesting parts of the country in which a more uniform geological structure, and a greater sameness of mineral character, are found to prevail, will not be entitled to the premium, unless they shall comprehend such an increase in the number of square miles beyond the minimum extent above specified, as the Directors may judge to be fairly proportioned to the circumstances of the case in these respects, and to the comparative facility with which the work may consequently appear to have been performed.

## 2. REPORTS ON COAL DISTRICTS.

Thirty Sovereigns, or a Piece of Plate of that value, will be given for the best Geological and Mineralogical Report upon any Coal District in Scotland, with the exception of those situated in the south-east part of the County of Fife, the north of Lanarkshire, and at Muirkirk in Ayrshire, which have already been reported on.

In these Reports, it is expected, that besides a general description of the district, the principal shaft sections, shewing the order of superposition and succession, as well as the thickness of the different strata, together with their lines of bearing, the direction and degree of their dip, and their organic contents, shall be carefully noticed and accurately detailed. The occurrence of slips, faults, or other disturbances, their direction, and the effects occasioned by them on the adjacent strata, must also be particularly noticed, with an explanation of their probable origin. The author must also particularly describe the trap-rocks, if any exist, in the coal-field, and specify their nature, situation, and extent. He will also state whether they intersect the other strata in the form of dykes, or in what other way they occur; and in each case he will describe what effect has been produced by them on the contiguous sedimentary strata. Limestone, iron, or any other profitable mineral or metallic substances in the district, must likewise be specially noticed.

Each Report must be accompanied by a general map or plan of the district, and coloured sections taken through such parts of it as may best serve to illustrate the above details, and also by specimens of organic remains, such as shells, vegetables, teeth, scales, bones, &c., all of which are, in the event of the author being found entitled to a premium, to be the property of the Society.

Where Peat Mosses occur in the district, the author will be ex-

pected not only to describe their extent, depth, quality, and general character, subsoil on which they rest, and susceptibility of improvement, but also any remarkable particulars regarding their component parts, such as the kind of wood, nuts, plants, or leaves, which prevail, or their accidental extraneous contents, such as horns, or any remains of works of art.

The varieties of Coal occurring in the district must be mentioned, as well as the price of each variety at the pit mouth. The use to which each variety of coal is generally applied, must also be noticed.

It will enhance the value of the Essays, in the opinion of the Society, if they contain a statement as to the probable quantity of Coal remaining in the district unworked, together with the data on which that statement rests. It would be desirable also, if information could be given generally as to the number of Pits where Coal is worked in the district, and as to the quantity of Coal (stated in tons) which, during each of the preceding three years, has been raised in it, the number of steam-engines, of colliers, and horses, employed to raise the same. Authors are invited also to direct their attention to the moral and social condition of the persons employed in the collieries.

Reports for the present year's competition to be lodged on or before the 20th of October next, under the conditions on pages 5 and 6.

No Report will be entitled to this premium unless the whole of the above conditions shall have been strictly fulfilled, and its merits will be estimated with reference to the amount and value of information given, rather than to the extent of country described.

The Society's Gold or Silver Medal will be given for such Reports on Coal Districts as may be found worthy of that distinction, but which may not be considered entitled to the principal premium, provided they are lodged with the Secretary by the time specified.

NOTE.—The Society takes this opportunity of pointing out to the Proprietors and Managers, and other individuals employed in Coal-Works, how much they have it in their power to contribute to the advancement of science, by noticing and preserving the organic remains that have been, or may be, found in the Coal-Fields with which they are respectively concerned. Fossil remains are most commonly met with in limestone, slate-clay, bituminous shale or blaes, and in the nodules and bands of ironstone; and it is earnestly recommended that the minors should be directed to lay aside, and to preserve as entire as possible, every extraneous substance of unusual form and appearance, which they may find in any of the beds in which they are working.

The Society will at all times be glad to receive communications on this subject, accompanied by specimens, and will confer Honorary Premiums upon those individuals who may most distinguish themselves by their intelligence, zeal, and diligence, in bringing important and interesting discoveries of this nature to its notice.

### 3. MINES AND MINERALS.

The Gold Medal, or a Piece of Plate of such value as the communication may be adjudged to deserve, will be given for the most satisfactory Report describing all the useful Metals or Minerals which might be profitably worked, and which are not now worked, in any particular District in Scotland, with the exception of Lismore, Appin, and Ardchattan, already reported. The district reported on must not be less than fifty square miles. The reports must be accompanied with specimens of the Metals or Minerals described; and these must, for the present year's competition, be lodged on or before the 20th October next, under the conditions on pages 5 and 6, and remain the property of the Society, in the event of a premium being awarded to the Reporter.

### 4. PRODUCTS OF PEAT-MOSS, LARCH PRUNINGS, &c.

The Gold Medal will be given for the best and approved Account of the Uses to which Peat Moss, Larch Prunings, &c. may be beneficially applied, and especially as to the extracting of Tar from these substances; and its application to the Smearing of Sheep, and other purposes to which foreign wood tar is now applied.

It is expected that the Competitors shall detail the experiments on which their Reports are founded, and shall add such observations as may occur on the production of Pyroligneous Acid from the same materials. Reports to be lodged on or before the 20th October 1839, under the conditions on pages 5 and 6.

### 5. COMPARISON BETWEEN DIFFERENT KINDS OF MANURE IN RAISING POTATOES.

It having been stated as the result of certain experiments communicated to the Society, that the Street Manure of Edinburgh is inferior about 30 per cent., or as 44 bolls are to 64, in raising Potatoes, to that obtained from Stables and Dairies, while it is nearly equally efficient in producing Turnips and some other descriptions of crop, the Society is desirous that the cause of this difference should be investigated, with the view of throwing additional light on the elements which enter into the composition of different de-



scriptions of vegetables ; and deeming that the statement above made affords a good opportunity for prosecuting this inquiry, offers the following Premium :—

Twenty Sovereigns, or a Piece of Plate of that value, will be given to the person who shall furnish the best and most approved explanation (founded on chemical analysis of at least the three descriptions of manure mentioned) of the cause of the inferiority of Street, or what in Edinburgh is commonly called “ Police Manure,” in the production of Potatoes, as compared with that obtained from stables and cow-houses.

It is expected that Competitors will furnish a statement of the nature and constitution of each description of Manure subjected to analysis, with such other facts as they deem essential for promoting the object the Society has in view in offering this Premium.

Reports to be lodged on or before the 20th October 1839, under the conditions on pages 5 and 6.

#### 6. EXTENDING APPLICATION OF WATER AND OTHER POWER TO FARM PURPOSES.

Ten Sovereigns, or Plate of that value, will be given for the best and approved Essay on the Extending of the Application of Water and other Power to Farm purposes.

The writer must enumerate the various subordinate purposes to which the power impelling thrashing-machines may be applied, such as cutting turnips, chopping hay, &c., and describe the safest, simplest, and most economical way of connecting the first power with these subordinate machines. He must also point out how premises at present generally in use for thrashing machines may be most conveniently adapted to these other purposes, and what better arrangement could, with the same view, be made in the erection of new premises.

The writer is requested to state his opinion as to the best construction of the first power ; that is to say, if steam be used, whether beam, crank, or any other kind of engine, and whether on the condensing or non-condensing principle ; if water be used, whether overshot, undershot, or breast-wheel, and so on with respect to other powers. The writer must accompany his Essay with explanatory Drawings and Estimates, to shew that his plans will not be attended with any considerable outlay or expense.

Reports to be lodged by 20th October 1839, under the conditions on pages 5 and 6.

7. COMPARATIVE EFFICIENCY OF TWO METHODS OF THOROUGH DRAINING.

It having been represented to the Society, as the result of extensive experience and observation, that the modern system of thorough draining is more efficient when the drains are cut in the direction of the natural slope or declivity of the ground, than when cut at right angles, or nearly at right angles, to the natural slope, as has been frequently practised, the Society, desirous of ascertaining if this representation is correct, and to obtain the scientific explanation of the fact, offers the following Premium :—

Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best and approved Account of the effects of the two methods of Cutting Drains above described, the depth of the Drains, and the distance between them being in both cases the same, with such explanation of the cause of the greater or less efficiency of either mode as the competitor may deem most satisfactory.

Reports to be lodged by 20th October 1839, under the conditions on pages 5 and 6.

8. REPORTS ON IRRIGATION.

Ten Sovereigns, or a Piece of Plate of that value, will be given for the best and approved account of the Management of Water Meadows, founded on actual experiment, within three years preceding the date of the Essay.

The experiments to be made on not less than five acres, whether detached or otherwise, and a description to be given of the rills or streams employed, and of the quality of the water, and of the manner of collecting and applying it, also an account of the land prior to the introduction of irrigation upon it, and of its estimated value at that period, and at the time when the Report is made; certified statements to be made of the quality of grass if any, cut green in the spring, and the quantity and quality of the hay and aftermath produced upon the portion reported on, and the kind of stock, if any, which has been allowed to depasture it.

The Essays, accompanied by a specimen of the hay produced that season, to be lodged on or before 20th October 1839, under the conditions on pages 5 and 6.

## 9. FOREST PLANTING.

For the best and approved Essay on Forest Planting, founded on personal observation and experience, or on known practical results, a Premium of Twenty Sovereigns, or a Piece of Plate of that value.

The Essay will be expected to include an account of the different soils, exposures, and declinations best suited for growing the various kinds of Forest Trees, with remarks on the climate of different Districts of Scotland, correct lists of the various genera, species, and varieties of Trees best adapted for particular situations, and the proportional number of each species which should be planted on a given space; an account of the comparative value of the different kinds of Trees, shewing the purposes for which the respective sorts are more applicable in affording wood for plough-wrights, and for general country purposes, for joists, deals, carpentry, or naval timber, &c. or useful bark; the influence of the different sorts of trees on the pastures below them, or in their immediate vicinity; notices of the insects and diseases which affect Forest-trees, with suggestions for their prevention or removal; together with remarks on the comparative advantages of the promiscuous planting of different kinds of Trees, or of grouping masses of the same species together, both in an economical and ornamental point of view.

Essays to be lodged on or before 20th October 1839, under the conditions on pages 5 and 6.

## 10. SHEEP-PASTURES AT HIGH ELEVATIONS.

For the most satisfactory account of the Plants constituting the Herbage on very elevated and mountainous Sheep-Pastures in Scotland, where Wedders are believed to thrive and to fatten so as to afford the finest mutton, and a similar account of the Plants constituting the old Pastures at the bases of mountains, understood to be favourable for Milch Cows, and adapted for the fattening of Cattle—A Gold Medal, or a Piece of Plate of its value, in the opinion of the Competitor.

Some of the most elevated Sheep-Pastures in Scotland, from 2000 to 3000 feet above the level of the sea, are considered by many sheep farmers to afford most nutritious herbage for feeding and fattening of prime-wedders; such are those on the side of Ben-voirlich, on the south-west of Strathconnan, on the high hills of Kintail, and on Benlawers in Perthshire. Various kinds of musci and lichens, and other plants, are intermixed with the

alpine grasses at those heights. It is required that the botanical and common names of all the plants, phænogamous and cryptogamous, constituting the pasturage, should be given, and that their proportional abundance should be specified as nearly as can be guessed. Dried specimens of the plants will also be required, with their names attached. Botanists visiting those lofty districts may learn from the more intelligent and observing shepherds their opinions as to the nutritive qualities of the plants, or at least of particular districts of pasturage where certain plants chiefly abound; and minute inquiry should be made as to the kinds of mosses and lichens observed to be most readily or greedily cropped by the sheep. The occurrence of sea-shore plants (belonging, for example, to the genera *Statice* and *Plantago*), on these elevated stations should be adverted to, salt herbage being accounted both nutritious and fattening.

It has been remarked, that old pastures near the bases of mountains, which always contain, among the gramineous plants, an intermixture of various musci, afford excellent food for milch cows, the milk proving both plentiful and rich; and that such old mossy pastures are said to fatten cattle more readily than recent artificial pastures. The musci in these should be examined and compared as to their qualities with those found on the more elevated sheep-walks, and specimens should also be transmitted.

To be lodged on or before the 20th October 1839, under the conditions on pages 5 and 6.

#### 11. IMPROVED SHEEP SALVE.

A premium of Twenty Sovereigns, or Plate of that value, will be given to the person who, on or before the 20th October 1839, shall lodge with the Society a specimen of a substance which can be economically employed for Smearing Sheep, with a view to secure the health and comfort of the animal, without deteriorating the value of the fleece or carcass, and which shall have been proved by at least two successive years' use on the same stock, not under 20 scores—one-fourth of the animals upon which the experiment is repeated, being the same as those upon which it was formerly tried.

The Society understands, that of late years a variety of new substances have been tried, which have either entirely or partially failed, and the wool-growers, especially in the Highland Districts, have been obliged to resort to the former plan of using tar and grease, believing from experience that no other known substance sufficiently protects the animal from cold and wet.

The great objection to tar is, that the value of the wool smeared with it is very much lowered, from the manufacturer being unable to render it sufficiently white to dye it any bright colour.

The Society is therefore anxious to procure a substance which will obviate this disadvantage, at the same time that the health and condition of the stock on which it is used may be completely preserved.

The Essays, with specimens of the Salve and of the ^{*}Wool, and a note of the price obtained for the latter, to be lodged by 20th October 1839, under the conditions on pages 5 and 6.

## 12. ON THE CROSSING THE CHEVIOT EWE WITH THE LEICESTER RAM.

The Gold Medal, or Ten Sovereigns, will be given for the best and approved Essay on the advantages or disadvantages attending the practice of crossing the Cheviot Ewe with the Leicester Ram.

The Essayist will be expected to give some account of the extent to which the practice is carried; and also to state the practical effect, if known, of *re-crossing* the produce with either the Leicester or Cheviot blood. Essays to be lodged on or before 20th October 1839, under the conditions on pages 5 and 6.

## 13. CULTIVATION OF THE RECENTLY INTRODUCED CEREAL AND OTHER GRAINS.

Ten Sovereigns, or Plate of that value, will be given to the cultivator in any district of Scotland, who shall submit the most perfect and approved Report, founded on actual experiments made for the purpose of ascertaining the comparative merits of the different varieties of Grain in cultivation, including wheat, barley, oats, beans, and pease, recently introduced, or not generally known in the district, the quantity of each variety sown not being under one imperial bushel.

The Reporter is required to state his opinion regarding their merits or demerits of the newer varieties, as compared with those generally grown in the district—taking into consideration the quality as well as the quantity of the produce; he will further advert to the nature of the soil, expense and altitude above the level of the sea, where his experiments may have been conducted; and will state his opinion as to what varieties are likely to succeed better or worse on soils, &c. differing from his own; giving at the same time, as far as he can ascertain, the origin

and history of the different varieties; and transmitting samples along with his Essay.

Information regarding varieties which Competitors may have been enabled to grow only in smaller quantities, will be considered an acquisition.

Reports to be lodged on or before 20th October 1839, under the conditions on pages 5 and 6.

#### 14. FEEDING OF FARM-HORSES ON RAW AND ON PREPARED FOOD.

It having been represented to the Society, as the result of careful observation, that Farm-Horses sooner attain good condition, though doing the same work, when fed with a given quantity of boiled or steamed Corn, than when the same quantity is given to them in a raw state, the Society, desirous that this point, which accords with some recent scientific discoveries, should be further investigated, offers the following Premium :—

Twenty Sovereigns, or a Piece of Plate of that value, will be given to the person who shall furnish the best and approved account of an experiment or experiments shewing how far the above statement is well founded. Competitors will be allowed to make the experiments with any of the usually cultivated descriptions of grain, such as Wheat, Barley, Oats, Beans, or Peas; and it is desirable that the accounts furnished should embrace as great a variety of these grains as possible.

Reports to be lodged by 20th October 1839, under the conditions on pages 5 and 6.

#### 15. EARLY REARING AND FATTENING OF LAMBS.

Ten Sovereigns, or Plate of that value, will be given for the best and approved account, founded on practical experience in Scotland, of the rearing and fattening of lambs of any breed, pure or cross, for table or market, by the term of Christmas.

Competitors are required to state the entire management of the ewes during the previous season, and of the lambs till disposed of; the expense attending their treatment, and how far the practice is likely to prove remunerative, taking into view the average state of the seasons, and prices in the market; the nature and cost of erections requisite for their protection or shelter; the results of management in former years, should the party

have practised the same, and such other particulars as may appear deserving of notice.

Reports to be lodged on or before the 20th October 1839, under the conditions on pages 5 and 6.

#### 16. INSECTS INJURIOUS TO AGRICULTURAL PLANTS.

Ten Sovereigns, or Plate of that value, will be given for the best and approved account of Insects injurious to Agricultural Plants.

Reports to be lodged on or before the 20th of October 1839, under the conditions similar to those specified for No. 17.

#### 17. INSECTS INJURIOUS TO FOREST-TREES.

Ten Sovereigns, or Plate of that value, will be given for the best and approved account of Insects injurious to Forest-Trees, especially the Larch and the various species of Pine.

Reports to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

It is required that the Essays for the Premiums Nos. 16 and 17 be the result of personal observation; specimens of each Insect, in its various stages, to be transmitted along with the Report—the nature and extent of the damage caused by the Insects to be explained—and the most effectual remedies which have been employed for preventing or checking their ravages, to be described; and, further, a distinct account to be given of the nature and condition, exposure and altitude above the sea, of the ground on which the plants or trees reported on were grown.

NOTE.—Accounts, by scientific entomologists, of noxious insects infesting the timber, bark, or foliage of trees, with suggestions for obviating their ravages, will be very acceptable to the Society, and Honorary Premiums will be awarded to the Authors of such communications, according to circumstances.

#### 18. COMPARATIVE NUTRITIVE PROPERTIES OF GRASSES.

Twenty Sovereigns, or Plate of that value, will be given to the Proprietor or Tenant in Scotland who shall, on or before the 20th October 1840, transmit to the Society a satisfactory Report of experiments made to ascertain the comparative nutritious qualities of the ordinary Grasses at different ages, on the same quality of soil, and managed in the same manner.

The experiments to be made by the feeding of milch-cows on pastures of different ages sown down in the same manner, and the same cows may be pastured on the different fields of grass by

alternate weeks or other equal periods, and the comparative produce ascertained by the quantity and quality of the milk produced. It is required that the quality of the soil shall be described, and the ages and kinds of Grasses of which the pastures consist, and that the breed of cattle and other particulars necessary to bring out a satisfactory result shall be given. Competitors are referred to the conditions on pages 5 and 6.

#### 19. EXTIRPATING FERNS FROM PASTURES.

Fifteen Sovereigns, or a Piece of Plate of that value, will be given for the best and approved account, founded on experience, of a cheap mode of eradicating Ferns from Pastures, and particularly from Hill Pastures, where the plough cannot be employed.

The extent of ground subjected to the experiment must not be less than twenty acres; the Report must state what proportion of the surface was occupied by the ferns, with the expense per acre incurred in their eradication, and must be lodged with the Secretary, accompanied by specimens of the ferns destroyed, on or before the 20th October 1840, under the conditions on pages 5 and 6.

There is evidence in favour of the belief that the object in view may be accomplished by repeated irrigation of the ground; also, that repeated cuttings of the ferns while young and succulent, thus preventing their bringing their tops to perfection during the whole season, or two consecutive years, will destroy them.

It is desirable that the truth of these opinions should be established or refuted, and any other successful mode of treatment pointed out.

#### 20. THOROUGH DRAINING.

The Society being desirous of obtaining information on the advantages arising from the system of thorough draining, offers

Twenty Sovereigns, or a Piece of Plate of that value, for the best and most satisfactory account of an experiment, made on not less than four acres of land, one-half of which shall have been Thorough Drained, and the other half Undrained. The crop to be of the same description on both portions of the field, and the cultivation in other respects as nearly as possible under the same circumstances. The quantity and quality of the produce of each portion to be stated. The dimensions of the Drains, their distance, and the materials with which they were filled to be noticed, and



the expense of the improvement given, with such other observations as the Experimenter may deem deserving of attention. Reports of experiments made in two or more years will give greater satisfaction than those which have been made in one year only. Reports to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

#### 21. SUBSOIL PLOUGHING OF THOROUGH DRAINED LAND.

With the view of obtaining farther information as to the advantage of the Subsoil Ploughing of thorough-drained land,

Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best and most satisfactory account of an experiment made on not less than four acres of land, of as nearly as possible the same quality and description, one-half of which shall have been subsoil ploughed, and the other cultivated in the ordinary way; the whole to be under the same description of crop, and in other respects both portions to be cultivated and managed alike. The quantity and quality of the produce of each portion to be stated; the depth reached by the subsoil plough to be noticed; with such other observations as the Experimenter may deem deserving of attention. Reports to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

#### 22. MOLE PLOUGH.

The Society, understanding that a considerable extent of ground has been successfully drained in England, at an expense not exceeding twenty shillings per imperial acre, by means of "the Mole Plough," offers a Premium of

Ten Sovereigns for the best and approved account of an experiment made in Scotland in the years 1839 and 1840, on not less than five imperial acres of pasture or arable land, one-half of which shall have been drained in alternate portions of four or six ridges, and the other half left undrained.

Reports to be lodged with the Secretary on or before the 20th October 1840.

#### 23. EXPERIMENTS WITH MANURES.

The Society being desirous to ascertain, by experiment, the value of certain substances recently introduced as Manures, offers a Premium of

Twenty Sovereigns for the best and approved account of an ex-

periment or experiments, shewing the fertilizing powers of at least four of the following substances, as compared with Manures in common use :—1, Jauffret's Engrais; 2, Kimberley's Trotsworth Liquid Manure; 3, Rosser's Vegetable Decomposition; 4, Owen's Animalized Carbou; 5, Clarke's Desiccated Compost; 6, French Poudrette; 7, The Chemical Seed Manure, advertised to be prepared by Hodgson & Simson, at Walton near Wakefield; 8, The Humus and Carbon, or the Paris and Flemish fertilizing and disinfected composts, prepared by Lance & Co.

The extent of ground experimented on not to be less than a quarter of an acre for each description of Manure. The quantity and cost of the different descriptions of manure employed, and the value of the crop produced by each, to be accurately ascertained and reported on, with such other particulars and observations as the Reporter may deem deserving of attention. Competitors must, along with their Reports, transmit at least half a pound weight of the soil collected prior to the commencement of the experiment, and about the same quantity of each kind of manure employed. Reports to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

#### 24. ANALYSIS OF BONE OR RAPE DUST.

Extensive experience having proved, that a ton of bone or rape dust is equal, in production of Turnips, to fifteen or twenty tons of well prepared farm-yard manure, the Society, considering it of importance to agriculture to ascertain the element or elements contained in the two former, on which this superiority depends, offers

The Gold Medal, or Ten Sovereigns, for the best and approved Essay, founded on chemical analysis, shewing the element or elements in Bone and Rape Dust which render them so much more efficient than farm-yard manure in producing Turnips.

The Essays will be expected to exhibit a chemical analysis of the three descriptions of manure mentioned, and of any other deemed by the Competitors essential to the object of the Society in offering this Premium.

Essays to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

#### 25. ON THE EFFECTS OF ALTITUDE ON VEGETATION.

For the best and approved Essay on the effects of Altitude on Vegetation, in the same latitude,

The Honorary Gold or Silver Medal, according to the merits of the communication.

Regard to be had to the corresponding difference of altitude and latitude in respect to the production and perfection of culmiferous and leguminous crops, and the hay and pasture grasses, and also in respect to the growth of forest-trees for timber. The nature of the soil and subsoil, and prevailing rocks, to be particularly attended to, and the distance from the sea to be specified. Essays to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

#### 26. FEEDING OF CATTLE.

Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best account of an experiment of the employment of substances other than the common produce of the Farm in the feeding of Live Stock.

The substances on which experiments may be made, are Oil Cake, Rape Cake, Malt Dust, Brewers' and Distillers' Refuse, Sugar, Molasses, Sago, or any other nutritive food. The animals put up ~~to feed, not to be fewer~~ than three Oxen for each kind of food on which the experiment is to be made. The live weight of the Oxen at the time of being put up to feed must be determined, and compared with that of an equal number of Oxen put up to feed on the common provender of the farm, as straw and turnips, hay and turnips, and the like; or, if the time of feeding shall be summer, grass used as herbage, or cut for soiling. The live, or if possible, the dead-weight of both classes of animals must be ascertained on the conclusion of the period of feeding; the quantities of food used in the experiment must be specified, and a calculation given of the expense of the two kinds of feeding. The quality of the meat to be stated when the Competitor has it in his power to do so. Reports to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

#### 27. FORESTS OF LARCH.

For the best and approved Essay on the more extensive cultivation of the Larch (*Larix communis*) in Scotland, particularly in reference to the expediency of forming extensive forests of that tree in the Highlands, with the view of supplying the Navy with timber—The Honorary Gold or Silver Medal, according to the merits of the communication.

Although the utility of Larch as naval timber is generally admitted, any additional evidence on the subject may with propriety be adduced. The essayist will also be expected to point out the various situations or localities that may be deemed most suitable for the purpose, including an account of the soils, subsoils, rocks, and Geological character of the Districts. The elevation above and distance from the sea should be stated as accurately as possible.

It will be of importance that particular notice be taken of the kind of soils and subsoils where the Larch has been found to form sound timber, and where it has proved liable to disease.

Competitors are referred to the Report on the Duke of Atholl's plantations, published in the ninth volume of the Society's Transactions. In the essays to be now communicated, the information must be original.

Essays to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

#### 28. ON RAISING IMPROVED VARIETIES OF GRAINS.

For a Report, founded on actual experiment, detailing the means which may have been successfully employed by the Reporter, for obtaining new and superior varieties of Grains, or improved subvarieties of those at present in cultivation, either by a minute attention to the selection of seeds by hybridation, or such other means as may have been found efficacious—The Gold Medal, or Ten Sovereigns.

It is necessary that the varieties or subvarieties reported upon, shall have been proved capable of permanent reproduction from seed, that the means employed for obtaining them be minutely stated, and also the relation they bear to others, or well known sorts; the Reporter is farther requested to state the effects that he may have observed different soils, manures, &c. to produce on certain varieties of Grains, and how far he may have ascertained such effects to be lasting. Reports to be lodged on or before 20th October 1841, under the conditions on pages 5 and 6.

#### 29. REPORTS ON IMPROVED RURAL ECONOMY ABROAD.

The Honorary Gold or Silver Medal of the Society, according to the value of the communication, will be given for approved accounts, founded on personal observation, of any useful practice or

practices in Rural or Domestic Economy adopted in other countries, which may seem fitted for being introduced with advantage into Great Britain.

However advanced the state of the Useful Arts may be considered in this kingdom, it is not to be doubted that there are many practices in use, both of Domestic and Rural Economy, in other countries, and particularly in France, the Low Countries, and the North of Germany, highly deserving of attention or imitation, and which yet are too apt to be disregarded or unnoticed by the traveller or casual resident. The purpose chiefly contemplated by the offer of the present premium, is to induce gentlemen who may visit other countries to take notice of and record such particular practices as may seem calculated to benefit their own country in the branches of the arts referred to; and it is proposed that the earliest opportunity shall, in all cases, be taken of communicating such details to the public.

#### 80. HONORARY PREMIUM FOR REPORTS ON CERTAIN DISTRICTS IN SCOTLAND.

To the person who shall, on or before the 20th October in any year, furnish to the Society the best account of a District in Scotland remarkable for any striking improvements that have been lately effected in it, whether with reference to its Husbandry or to the establishment of useful Manufactories, of Fisheries, or of additional facilities for External or Internal Communications, such as Harbours, Railroads, or other means of public conveyance, including the state and management of Public Roads, and generally of such other improvements as have a direct tendency to increase the physical resources of the district—The Society's Gold or Silver Medal, or a Piece of Plate, as the Directors may see fit in the circumstances of the case.

The Report is expected to be given from the writer's experience or observation, and the extent of the District reported upon is not to be less than fifty square miles.

In describing the present state of husbandry, authors are required to advert to the general character of the surface in regard to its being rocky, or consisting of soil; and in describing the latter, they must state by what means it appears to have been formed, whether by disintegration of the subjacent or adjoining strata, or by transportation from other localities. The authors must also mention, and describe generally, the kind of trees

which appear to thrive best within the district, and they must state whether, and what different kinds shew the most rapid and vigorous growth on the several descriptions of soil. They must also give an account of the prevailing native plants on uncultivated situations. Some account must likewise be given of the improvements made or in progress in the methods of tillage, the breeds of stock, the modes of cropping, the progress and methods of drainage, and the like. They will also give a particular account of any advantageous modes of managing estates and conducting their improvement, which may have been adopted by proprietors or their agents in the district.

Where peat mosses occur in the district, the author will be expected not only to describe their extent, depth, quality, and general character, subsoil on which they rest, and susceptibility of improvement, but also any remarkable particulars regarding their component parts, such as the kind of wood, nuts, plants, or leaves which prevail, or their accidental extraneous contents, such as horns, or any remains of works of art.

In reference to the offer of the Premium, which is alternately made for *Manufacturing Improvements* in a district, authors must, in describing these, not only state the nature of the commodity or article manufactured, but also the nature of the machinery, and other means by which the manufactory is carried on; the number of persons of different sexes and ages employed, the value of the manufactory, the markets to which the articles manufactured are sent, the nature of the raw materials, and the source or sources whence they are respectively derived.

Authors, in treating of either kind of improvements, according as their knowledge and experience may best enable them, are required particularly to state the effects which have been thereby produced, not merely in respect of the annual revenue thence accruing, but also on the moral, social, and physical condition of the inhabitants. The authors should, in their accounts, mention the elevation of the principal points of the district above the sea. They are likewise invited to offer suggestions for the future improvement of the district, whether physically or morally.

It is further expected, that authors, if the district they undertake to give an account of happens to have been already described in any well-known publication, will avoid repeating the information which may be found there, and merely refer to such publication.

### 31. INVESTIGATION OF CERTAIN POINTS CONNECTED WITH THE SCIENCE OF AGRICULTURE.

The Society being desirous of encouraging inquiries, and obtaining information on every subject connected with Agriculture, and being aware, at the same time, how little is known with regard to some of the fundamental principles of Agriculture, hereby announce, that they will receive with favour, and reward liberally, Essays or Memoirs on any of the following subjects; the precise amount of the Premiums to be fixed by the Directors according to their opinion of the merit and value of the respective Essays.

With a view to this important object, the Society have set apart Fifty Sovereigns annually, to be awarded for such approved communications as may be lodged on any of the subjects referred to. In the event of papers being communicated in any year which shall appear to merit a sum greater than the Directors have at their disposal, some of these papers will be directed to stand over to receive rewards in a future year.

1. An Essay or Memoir explaining, on scientific principles, the mode in which Soil operates in producing or facilitating the germination and growth of Vegetables.

2. An Essay or Memoir describing and proving, on scientific principles, what is the best admixture of the ordinary elements of Soil for promoting the germination and growth of particular Vegetables.

3. An Essay or Memoir describing, on scientific principles, the mode in which Lime operates in rendering the Soil better adapted for the germination and growth of particular Vegetables.

4. An Essay or Memoir explaining, on scientific principles, the effect of Drainage in altering the constitution or qualities of the Soil, and increasing its fertility.

5. An Essay or Memoir shewing the nature of the atmospheric influences on Soil in promoting its fertility, including the modification of these influences arising from heat and cold, dryness and moisture.

NOTE.—It is expected, and is to be explicitly understood, that the authors of the above Essays will not offer mere speculative conjectures on the subjects treated of, and far less make a compilation of the opinions of others. They must be able to state, that they have themselves studied and investigated the subject treated of. They must also explain the nature and the mode of inquiry adopted by them, and detail the experiments which they have instituted, from which their inferences have been derived. The Essays or Memoirs to be lodged by the 20th of October in any year, under the conditions on pages 5 and 6.

## CONDITIONS OF COMPETITION FOR ESSAYS AND REPORTS.

The Conditions of Competition for Essays and Reports will be found under the "Notice to Candidates," on pages 5 and 6, to which Competitors are particularly referred.

The Essays and Reports on subjects 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16, are to be lodged on or before the 20th October next, 1839; those on subjects 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, and 27, by 20th October 1840; on subject 28, by 20th October 1841; and Reports and Essays on subjects 29, 30, and 31, by 20th October in any year.

## CLASS III.

## WASTE LANDS.

## 1. IMPROVEMENT OF A SPECIFIED EXTENT OF LAND BY TILLAGE.

To the Proprietor or Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society the most satisfactory Report of having successfully improved and brought into profitable tillage, within a period of five years immediately preceding the date of his communication, an extent of waste and hitherto uncultivated Land, not being less than one hundred acres—The Gold Medal.

To the Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society a satisfactory Report of having, within the period of three years preceding the date of his Report, successfully improved, and brought into profitable tillage, an extent of waste and hitherto uncultivated Land, not being less than thirty acres on the same farm—The Honorary Silver Medal.

The Reports in competition for both Premiums may comprehend such general observations on the Improvement of Waste Lands as the writer's experience may have led him to make, but they are required to refer especially to the land reclaimed, (which, if not in one continuous tract, must be in fields of considerable extent), to the nature of the soil, the previous state and probable value of the ground, the obstacles opposed to its improvement, the mode of management adopted, the expense, and in so far as can be ascertained, the produce and value of the subsequent crops; and the land must have borne one crop of grain, at least, previous to the year in which the Report is made. The Reports must be accompanied by a detailed statement of the expense, and by a certified measurement of the ground. Competitors for the more limited extent improved will observe, that



having gained the Silver Medal, it shall not afterwards be competent to include the same improvement in a subsequent claim for the Gold Medal. Competitors for both Premiums will attend to the general conditions, which will be found on pages 5 and 6.

## 2. IMPROVEMENT OF A SPECIFIED EXTENT OF LAND FOR PASTURE.

To the Proprietor or Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society the most satisfactory Report of having, within the period of five years immediately preceding the date of his communication, successfully improved an extent of waste and hitherto uncultivated Land, not being less than one hundred acres, by draining, accompanied with irrigation or top-dressing with lime or other substances, or paring and burning the surface, and sowing grass seeds with or without a grain crop—The Gold Medal.

To the Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society a satisfactory Report of having, within the period of three years preceding the date of his report, successfully improved for pasture an extent, not being less than thirty acres on the same farm, of waste and hitherto uncultivated Land, in the manner indicated in reference to the immediately preceding premium—The Honorary Silver Medal.

The Reports are required to advert to all the particulars specified in the conditions in the Premiums for the improvement by tillage, so far as these are applicable to the improvement of land for pasture; and the land must have been hayed or pastured three years at least previous to the year in which the Reports are made. The Reports must be accompanied by a detailed statement of the expense, and by a certified measurement of the ground. Competitors for the more limited extent will observe, that, having gained the Silver Medal, it shall not afterwards be competent to include the same improvement in a subsequent claim for the Gold Medal. Competitors for both Premiums will attend to the general conditions on pages 5 and 6.

## 3. RECLAIMING LAND FROM THE SEA.

To the Proprietor or Tenant in Scotland who shall, on or before the 20th of October 1839, transmit to the Society a satisfactory Report of his having, within the period of five years immediately preceding, reclaimed from the Sea an extent of, not less than five

acres of Land, or having converted into pasture an extent of not less than five acres of barren ground, periodically overflowed by the Sea. The expense and mode of improvement to be accurately detailed, and the returns such as to hold out a reasonable prospect of remuneration—The Honorary Silver Medal, or a Piece of Plate, as in the opinion of the Directors the improvement may deserve. Competitors will attend to the general conditions on pages 5 and 6.

#### 4. RECLAIMING LAND BY EMBANKING RIVERS.

For the most satisfactory Report of the Embankment of a River in Scotland, causing a profitable addition to or amelioration of the neighbouring lands, in consequence of securing them from the effects of inundations to which they have been previously subject—The Silver Medal, or a Piece of Plate of such value as the communication may be adjudged to deserve. Competitors will particularly attend to noticing any effectual means which may have been adopted for preventing the inroads of moles or other vermin into the embankment.

Reports to be lodged by 20th of October 1839, under the conditions on pages 5 and 6.

NOTE—The Premiums Nos. 3 and 4, having been offered for some years, it is proposed to discontinue them, at least for some time, after 1839.

### CLASS IV.

#### CROPS AND CULTURE.

##### 1. NEW PLANTS ADAPTED TO FIELD CULTURE.

To the person who shall, on or before the 20th October in any year, report to the Society any new species or variety of useful Plant, adapted to the ordinary field culture of Scotland—The Silver Medal, or a Piece of Plate, as the Directors may see fit in the circumstances of the case.

Particular attention is directed to the raising or procuring of new varieties of Cereal Grains, as well as of the more useful Herbage and Forage Plants; in the latter department a new variety of Italian Ryegrass, possessing the qualities of bulk of produce, permanency of duration, or other advantages calculated to render it superior to the common sort, will be considered an acquisition.

Satisfactory evidence will be required that the plant produced is new in the cultivation of the country, either as regards the spe-

cies or variety, valuable as regards the uses to which it may be applied, and congenial to the soil and climate of Scotland. A particular detail of the discovery, or circumstances which led to the experiment, must be furnished, the mode of culture described, and a specimen of the plant transmitted; with such suggestions as to the probable value of its straw as experience may have enabled the competitor to afford.

## 2. SAVING HAY.

To the Farmer, Land-Steward, Overseer, or other person in the actual charge of a Farm, who shall in any one year have stacked not less than 500 Stones of Hay in the best condition, the produce of his own Farm, or of the Farm of which he is in charge—The Silver Medal.

In order to draw the attention of practical Agriculturists to the Saving of Hay, and to the papers on the subject which have been published in the Society's Transactions, six honorary appropriate Silver Medals will be assigned for three years successively upon the applications first lodged, and in the order in which they are applied for, under the following conditions:—

A certificate must be lodged with the Secretary by any two Members, prior to the Summer half-yearly General Meeting of the Society, that not fewer than three persons have agreed to compete in any district during that season for some one specific description of Hay, whether Clover and Rye-grass, Natural Grass, Watered Meadow, or Upland; and that the competitors had agreed in naming a Judge to decide upon the quality of the Hay for which they intend to compete. The Judge to be so named shall inspect the Hay, and give his decision in writing betwixt the 1st and 20th of January following, and will award the Medal for the Hay of the best quality and in the best condition, if he shall be of opinion that any competitor merits it. A report of the award, accompanied by an account, to be furnished by the successful competitor, of the mode of treatment followed by him, and particularly of the time which elapsed betwixt the moving and stacking, and whether the Hay was put into tramp ricks or carried at once to the stack, shall be immediately transmitted to the Secretary by the Members of the Society who signed the certificate; and on the receipt of the Report, the Secretary will forward the Medal to be delivered to the successful competitor.

### 3. STRAW PLAIT.

1. To the person who, in the years 1838 and 1839, shall have grown and prepared in the best manner for Straw Plait, in any District of Scotland where Premiums for the preparation and manufacture of that article have not already been awarded by the Society, the greatest quantity of Rye Straw, on not less than two acres—Ten Sovereigns, or a Piece of Plate of that value.

Competitors to lodge with the Society, on or before the 20th of October 1839, average samples of their prepared Straw, accompanied by authenticated measurements of the ground upon which the crop was raised, with statements explanatory of the management throughout, of the nature and value of the soil, and of the value of the produce.

It has been represented to the Society, that rich or superior soils are unsuited to the growth of Rye Straw for Plait, and that waste sandy links and inferior light soils in low or early situations, such as are frequent along both sides of the Firth of Forth, and other parts of the coast, are those on which its growth is most likely to prove profitable.

2. To the person who shall, between 30th January 1838 and 20th October 1839, have got Plaited or Manufactured, in any district of Scotland where Premiums for this branch of industry have not been already awarded by the Society, the greatest quantity of Rye Straw—Six Sovereigns.

To the person who shall have got Plaited or Manufactured the second greatest quantity as aforesaid—Four Sovereigns.

Competitors to produce certificates by two Members of the Society, attesting the quantity manufactured, and transmit samples of the different kinds of Plait made. They will also lodge an account of the expenditure and market value of the manufactured article, with information as to the class of persons employed, amount of their daily earnings, and such information generally as may be considered will forward the object in view, of encouraging the improvement of the female, juvenile, and infirm portion of the labouring classes, by introducing habits of cleanliness and industry. Claims to be lodged by 20th October 1839.

### 4. PLOUGHING COMPETITIONS.

Premiums to Ploughmen for improvement in Ploughing having for some years been given very generally over the country by the

resident Gentlemen and Local Farming Societies, the Highland and Agricultural Society has, in the mean time, discontinued them ; but being desirous of encouraging improvement in this branch of husbandry, the Society will give its Silver Plough Medal to the Ploughman found to be the best at such competitions, provided not fewer than fifteen ploughs shall have started, and that premiums in money to an amount not less than Three Sovereigns shall have been awarded. It shall be competent to the Judges of the competition, in deciding on the merits of the Competitors, to take into consideration the time occupied in ploughing the ground assigned to the Competitors respectively. The Medal will be issued upon a Report from one or more Members of the Society, who shall have actually attended the competition, stating the number of ploughs that had started, the number and amount of the money premiums awarded, and that the Ploughman found to be the best had not received the Society's Medal at a previous competition in the same district.

The Report must be lodged with the Secretary, at the Society's Hall, within three months after the Competition, otherwise the Medal will not be issued.

## CLASS V.

### PASTURES.

#### 1. MANAGEMENT OF PASTURE LANDS.

The Gold Medal, or a Piece of Plate of the same value, will be given to the Proprietor or Tenant in Scotland who shall, on or before the 10th of November in any year, report to the Society the most successful Management of Pasture Lands, founded on practice.

The land, forming the subject of the Report, must have been pastured for at least three seasons, exclusive of that in which the Report is given in, and the extent of ground must not be under ten acres. If the land has been sown down within a period of eight years previous to that in which the Report is made, the reporter will be required, besides stating the mode adopted in laying down, and the kinds and quantities of seeds used, to give a correct detail of the management from the period of sowing until the land be sufficiently consolidated for the purpose of being depastured. In any case, the reporter will be required to state the kind and quality of the soil, with its exposure and elevation, the mode of drainage, and the various proportions of

grasses and other plants constituting the pasture; the means which have been employed in maintaining or increasing the productiveness of the herbage by top-dressing or otherwise; the description of stock grazed; and the modes which have been found most successful in practice, of preventing or destroying the growth of plants injurious to the pasture.

Competitors are referred to the general conditions on pages 5 and 6.

## CLASS VI.

### LIVE-STOCK—DISTRICT COMPETITIONS.

#### § I. CATTLE.

PREMIUMS FOR IMPROVING THE BREED OF CATTLE IN THE  
FOLLOWING DISTRICTS:—

1. *The Islands of Islay, Jura, and Colonsay, in the county of Argyll.*
2. *The District of Argyll, and the parishes of North and South Knapdale, and the parish of Kilberry, north of the Isthmus of Tarbert, Argyllshire.*
3. *The Braemar District of Aberdeenshire, comprehending the parishes of Braemar, Crathie, Tullich, Glenmuick, and Glen-gairn, but excepting that part of Tullich situated in Cromar.*
4. *The Districts of Eskdale and Liddesdale, in the counties of Dumfries and Roxburgh.*
5. *The Islands of North and South Uist, Harris, Barra, and small Isles adjacent, in Inverness-shire.*
6. *The Districts of Breadalbane, Glenorchy, Glenlyon, Glenochy, Glendochart, Glenfalloch, and Rannoch, comprehending the parishes of Kenmore, Killin, Glenorchy, Fortingall, Dull, Weem, and Logierait, in the counties of Perth and Argyll.*
7. *The District of Garioch, Aberdeenshire.*
8. *The Parishes of Glenisla, Lintrathen, Kirriemuir, Lochlee, Edzel, Lethnot, Cortachy, Clova, Airlie, Glammis, Forfar, Tannadice, Fearn, Ruthven, Kingoldrum, and Menmuir, in the county of Forfar.*
9. *The District of Formartin, in Aberdeenshire.*
10. *The County of Renfrew.*
11. *The Eastern District of Fifeshire, comprehending the parishes of Kilconquhar, Elie, St Monance, Pittenweem, Carnbee, East*

- Anstruther, West Anstruther, Kilrenny, Craill, Kingsbarns, St Andrew's, Denino, Cameron, Leuchars, Newburn, Largo, Leven, Scoonie, Forgan, and Ferry-port-on-Craig.*
12. *The Parishes of Inveravon, Kirkmichael, Mortlach, and Aberlour, in Banffshire, and Cabrach and Knockando, in Aberdeen and Moray shires.*
  13. *The Counties of Moray and Nairn.*
  14. *The District of Turriff, in the Counties of Aberdeen and Banff.*
  15. *The County of Linlithgow.*
  16. *The District of Auchtermuchty, Fifeshire, comprehending the parishes of Auchtermuchty, Falkland, Strathmiglo, Newburgh, Abdie, those parts of the parishes of Arngash and Abernethy, in the County of Fife, and those parts of the parishes of Collessie and Kettle lying to the Westward of the Turnpike Road leading from New Inn by Trafalgar to Newburgh.*
  17. *The Counties of Stirling and Clackmannan, and that part of the County of Perth which is under the jurisdiction of the Sheriff-substitute of the Dunblane District.*

For the best Bull, from two to seven years old, to be exhibited at the Competition in each of the six Districts, Nos. 1, 2, 3, 5, 6, and 12, as above described, *bona fide* the property of a Proprietor, Factor, or Tenant, and kept in his possession from the 20th day of May preceding the Competition—The Honorary Silver Medal.

For the best Bull, from two to seven years old, *bona fide* the property, and in possession, of any Tenant in each of the said six Districts, Nos. 1, 2, 3, 5, 6, and 12, kept on his farm within the District, from the 20th day of May preceding the Competition—Ten Sovereigns.

For the second best Bull, of the same age, in each of the said six Districts, the property, and in the possession, of any Tenant, and kept on his farm within the District for the foressaid period—Five Sovereigns.

For the best two Queys of three years old, the property of, and bred by, any Tenant in each of the five Districts, Nos. 1, 2, 3, 5, and 6, above described—Five Sovereigns.

For the second best two Queys of three years old, the property of, and bred by, any Tenant in each of the said five last-mentioned Districts—Three Sovereigns.

For the best two Queys, of three years old, the property and in possession of any Tenant in the said District No. 12, above de-

scribed, from the 20th day of May preceding the Competition, and which shall be kept by him within the District for at least one year after the award of the Premium—Five Sovereigns.

For the second best two Queys, of three years old, the property and in possession of any Tenant in the said last-mentioned District, to be kept as aforesaid—Three Sovereigns.

For the best Bull, from two to seven years old, *bona fide* the property, and in possession, of any Proprietor or Tenant, in *each* of the Eleven Districts, Nos. 4, 7, 8, 9, 10, 11, 13, 14, 15, 16, and 17, as above described, kept on his farm, within the District, from the 20th day of May preceding the Competition—Ten Sovereigns.

For the second best Bull, of the age above specified, *bona fide* the property, and in possession, of any Proprietor or Tenant, in *each* of the said Eleven Districts, and kept on his farm, within the District, for the aforesaid period—Five Sovereigns.

For the best two Queys, of two years old, the property of, and bred by, any Tenant in *each* of the said Eleven Districts, Nos. 4, 7, 8, 9, 10, 11, 13, 14, 15, 16, and 17—Five Sovereigns.

For the second best two Queys, of two years old, the property of, and bred by, any Tenant in each of the said Eleven Districts, Three Sovereigns.

The competition in the Districts Nos. 1 to 10, both inclusive, will take place in 1839, and in Nos. 11, 12, 13, 14, 15, 16, and 17, in 1840.

The following Members of the Society (as Members only, or their Factors in their absence can be named) are hereby appointed Committees for regulating all details at the Competition for the Ten Districts first above mentioned. In Districts Nos. 11, 12, 13, 14, and 15, the Committees were named in the advertisement of 1838, and the Committees for the Districts Nos. 16 and 17 will be intimated in that of 1840.

**FOR THE FIRST DISTRICT**—Walter Frederick Campbell, Esq. of Islay, M. P.; Walter Campbell, Esq. of Sunderland; Colin Campbell, Esq. of Jura; Archibald Campbell, Esq.; Richard D. Campbell, Esq.; G. Todd Chiene, Esq.; Archibald MacDonald, Esq.; Colin McLean, Esq. Laggan; Captain Alexander McNeill, younger of Colonsay; Duncan MacNeill, Esq. advocate; Malcolm MacNeill, Esq. Lossit; *and any other Members in the District*; three a quorum. Mr Campbell of Islay, in his absence Mr Campbell of Jura, and Mr Campbell of Sunderland, to be Conveners.

**FOR THE SECOND DISTRICT**—The Duke of Argyll; Lord John



Campbell; Sir Archibald Campbell of Succoth, Bart.; Sir John Poulett Orde of Kilmory, Bart.; Robert Bruce, Esq. Sheriff of Argyllshire; Alexander Campbell, Esq. of Ederline; Alexander Campbell, Esq. of Auchindarroch; Colin Campbell, Esq. of Jura; Duncan Campbell, Esq. of Ross; George Campbell, Esq. Succoth; James Archibald Campbell, Esq. of Inverawe; John Campbell, Esq. of Stonefield; Robert Campbell, Esq. of Sonachan; Alexander Campbell, Esq. of Monzie; Lachlan Macneil Campbell, Esq. of Kintarbert; Lieutenant-Colonel John Elphinstone; Colin Macdougall, Esq. of Lunga; Neil Malcolm, Esq. of Paltalloch; Dugald Sinclair, Esq. Kilchamaig; *and any other Members in the District*; three a quorum. Sir John P. Orde, Bart., in his absence Mr Campbell of Stonefield, to be Convener.

FOR THE THIRD DISTRICT—The Marquis of Huntly; the Marquis of Abercorn; the Earl of Fife; the Earl of Aboyne; the Hon. Captain William Gordon, M.P.; James Farquharson, Esq. of Invercand; David Gordon, Esq. of Abergeldie; Michael Gordon, Esq. yr. of Abergeldie; John James Roy, Esq. Altdourie Cottage; Andrew Robertson, Esq. Crathie; *and any other Members in the District*; two a quorum. Mr Farquharson of Invercand, in his absence Mr Roy, to be Convener.

FOR THE FOURTH DISTRICT—The Duke of Buccleuch; Lord John Scott; the Right Hon. Sir James Graham, Bart. M.P.; J. J. Hope Johnston, Esq. M.P.; William Blamire, Esq. formerly M. P. for Cumberland; Thomas Chalmers Borthwick, Esq. of Hopetrig; G. Scott Elliot, Esq. of Larriston; George Bell, Esq. Woodhouslees; A. H. Maxwell, Esq. of Portrack; W. Oliver Rutherford, Esq. of Edgerston; Major Oliver of Bush; Thomas Stavert, Esq. of Hosecoat; *and any other Members in the District*; three a quorum.—The Duke of Buccleuch, in his absence Mr Scott Elliot, to be Convener.

FOR THE FIFTH DISTRICT—Lord Macdonald; R. G. Macdonald, Esq. of Clanranald; R. Macneil, Esq. of Barra; R. Macdonald, Esq. of Bornish; Donald Maclean, Esq. of Boreray; Duncan Shaw, Esq. Factor to Lord Macdonald; Charles Shaw, Esq.; Mr Stewart Harris; *and any other Members in the District*; two a quorum.—Lord Macdonald, in his absence Mr Duncan Shaw, to be Convener.

FOR THE SIXTH DISTRICT—The Marquis of Breadalbane; Sir Neill Menzies, Bart.; Sir John Stewart, Bart.; Archibald But-ter, Esq. of Fascal; J. L. Campbell, Esq. of Glenfalloch; Archibald Campbell, Esq. Factor on the estate of Menzies; Co-

lonel J. Macdonald of Dalchoisnie; James Menzies, Esq. of Pitnacree; John Menzies, Esq. of Chesthill; Major Archibald Menzies, late 42d regiment; Mr Cumming Menzies of Knockintober; Alexander Stewart, Esq. of Derculich; Alexander Stewart, Esq. of Glencribisdale; Robert Stewart, Esq. of Ardvorlich; James Stewart Robertson, Esq. of Edradynate; Robert Robertson, Esq. of Auchleeks; Captain Robertson of Kindrochit; Mr Stewart, Chesthill; Mr Wylie, Bolfracks; *and any other Members in the District*; five a quorum—The Marquis of Breadalbane, in his absence, Sir Neil Menzies, to be Convener.

FOR THE SEVENTH DISTRICT—The Earl of Kintore; Sir R. D. Horn Elphinstone, Bart.; Lieutenant-General Sir A. Leith of Freefield; John Burnet, Esq. of Kemnay; Colonel W. H. Knight Erskine of Pittodrie; Colonel Fraser of Castle Fraser; David John Gordon, Esq. of Wardhouse; James Gordon, Esq. of Manar; John Gordon, Esq. of Newton; Robert Grant, Esq. of Tillyfour; Colonel Sir Andrew Leith Hay of Rannes; Patrick Irvine, Esq. of Inveramsay; George Leslie, Esq. of Rothie; William Leslie, Esq. of Warthill; H. Leith Lumsden, Esq. of Auchindoir; Hugh Lumsden, Esq. of Pitcaple; R. Mackenzie, Esq. of Glack; J. Mackenzie, Esq. younger of do.; B. C. Urquhart, Esq. of Meldrum; Mr Walker, Suttie; *and any other Members in the District*; five a quorum—Sir R. D. H. Elphinstone, in his absence, Mr Lumsden of Pitcaple, to be Convener.

FOR THE EIGHTH DISTRICT—The Earl of Airlie; Lord Panmure; Colonel the Hon. D. Ogilvy of Clova; the Hon. W. Ogilvie, Airlie Castle; Lieutenant-Colonel Chalmers of Glenelicht; Alexander Crookshanks, Esq. of Keithock; Mr Carnaby, Forfar; Mr Dalgairns, Ingliston; Thomas Farquharson, Esq. of Baldovie; Thomas Gardyne, Esq. of Middleton; John Guthrie, Esq. of Guthrie; John Guthrie, Esq. younger of Guthrie; Charles Hay, Esq. of Ballindoch; George Kinloch, Esq. of Kinloch; George Lyon, Esq. of Glenogil; Mr Macnicol, Factor to Lord Airlie; John Ogilvie, Esq. of Inchewan; P. Wedderburn Ogilvie, Esq. of Ruthven; W. D. Proctor, Esq. of Halkerton; Thomas Rattray, Esq. younger of Brewlands; Major James Wilkie of Newbarns; *and any other Members in the District*; five a quorum—The Earl of Airlie, in his absence, the Hon. W. Ogilvie, to be Convener.

FOR THE NINTH DISTRICT—The Earl of Aberdeen; the Hon. Captain William Gordon, M. P.; Sir Michael Bruce of Scotstoun; Sir William C. Seton of Pitmedden; and Sir R. D. Horne Elphinstone of Logie Elphinstone, Baronets; William Gordon,

Esq. of Fyvie; B. C. Urquhart, Esq. of Meldrum; *and any other Members in the District*; three a quorum—Captain the Hon. William Gordon, M. P., in his absence, Mr Urquhart of Meldrum, to be Convener.

FOR THE TENTH DISTRICT—The Earl of Glasgow; Viscount Kelburn; the Hon. Charles Stuart; Sir William Milliken Napier of Milliken, and Sir John Maxwell of Pollock, Baronets; William Maxwell Alexander, Esq. of Southbar; Dr W. S. Anderson, H. E. I. C. Service, Greenock; Roger Aytoun, Esq. banker, Greenock; R. Cunninghame Bontine, Esq. of Ardoch; Alexander Campbell, Esq. Sheriff-Substitute, Paisley; John Colin Dunlop, Esq. Sheriff of the County; William Warwick Finlay, Esq. younger of Trees; William M. Fleming, Esq. of Barrochan, Vice-Lieutenant of the County; Robert Freeland, Esq. of Gryffe Castle; Lieutenant-Colonel James Lee Harvey of Castlesempie; John Rae Lee Harvey, Esq. younger of Castlesempie; Archibald Hastie, Esq. M.P. for Paisley; George Houston, Esq. younger of Johnstone, M.P. for the County; Ludovick Houston, Esq. of Johnstone Castle; Claud Marshall, Esq. Sheriff-Substitute, Greenock; John Maxwell, Esq. younger of Pollock; William Napier, Esq. of Blackstone; Alexander H. Simpson, Esq. Paisley; James Smith, Esq. of Jordanhill; Alexander Speirs, Esq. of Elderslie, M. P.; Moses Stephen, Esq. of Polmadie; Captain Houston Stewart of Carnock, R. N.; Robert Stewart, Esq. of Stewarthall; John Shaw Stewart, Esq. advocate; Robert Wallace, Esq. of Kelly, M.P.; John Wilson, Esq. of Thornly; *and any other Members in the District*; five a quorum—John Maxwell, Esq. younger of Pollock, in his absence, William Maxwell Alexander, Esq. of Southbar, to be Convener.

FOR THE ELEVENTH, TWELFTH, THIRTEENTH, FOURTEENTH, and FIFTEENTH DISTRICTS, the Committees remain as last year, with the addition of those resident Members since elected.

FOR THE SIXTEENTH DISTRICT—O. Tyndall Bruce, Esq. of Falkland, and Archibald Walker, Esq. Auchtermuchty; and in the SEVENTEENTH DISTRICT, William Ramsay Ramsay, Esq. of Barnton, to be Conveners of the Committees of resident Members.

#### RULES OF COMPETITION.

1. The Conveners, with the approbation of a quorum of the Committees for conducting the several Competitions, are respectively authorized, in such cases as they shall see proper, to divide the two Premiums allowed for Bulls into three Premiums, in such proportions as they shall approve; the first Premium

for Bulls not being less than Eight Sovereigns; and, in like manner, to divide the sums allowed for Queys into three Premiums, fixing their amount.

2. The Committee shall not place for Competition any Stock which, in their opinion, does not fall within the regulations prescribed, or does not possess merit; and in no instance shall any of the Money Premiums be awarded, where there are not after such selection, at least three Competitors, reserving to the Committee in the case here provided for, to make such allowance to a party shewing stock of merit, not exceeding half the amount of the Premium, as under the circumstances they may think reasonable.

3. The times and also the places of Competition, are to be fixed by the Convener, with the advice of at least a quorum of their respective Committees, except in the 5th and 13th Districts, as to which Benbecula is named as the place of Competition for the former, and in the latter Elgin and Forres alternately are fixed. The Competition for the Society's and for the District Premiums are to take place between the 1st of June and 1st day of November next.

4. The Convener of each Committee will give timely notice to the other Members of the Committee of the place and time of the Competition, and will be particularly careful that the same be intimated at the several parish church-doors within the District, for at least two successive Sundays previous to the Competition, or in such other form as shall be previously approved of by the Local Committee.

5. As these Premiums were given, in some of the above-mentioned Districts, in 1834, 1835, 1836, 1837, and 1838, it is to be observed, that the Society does not admit an animal, in any Class of Stock, which may have gained the Society's first Premium at a District or General Show in a former year, to be again shewn in Competition in any District; and for no description of Stock shall either the same or a lower denomination of Premium be awarded, in the District in which they have already gained a Premium. In those Districts where the Honorary Silver Medal is offered for Bulls, Tenants cannot compete with the same animal both for the Honorary and the Money Premiums.

6. No Member of the Committee showing stock of his own at the Competition shall act as judge; nor shall Factors when they are Members of the Society, and are named on the Committee, or when acting in the absence of Proprietors, be entitled to compete for the Money Premiums in those districts, and Classes in which Proprietors are excluded from Competition. It is recommended to the Committee to take the assistance of practical men as judges in awarding the Premiums. In all cases, the Bulls for which the Money Premiums are awarded, must have served, or shall be kept to serve, the District, for at least one season, at a moderate charge for each Cow, and the rate may be fixed by the Committee. The same person is not to obtain more than one of the Premiums for Bulls, nor more than one of the Premiums for Queys, in one year, except in those Districts where Tenants compete for the Honorary and Money Premiums for Bulls, in which case they may, with different animals, carry the Medal and one of the Money Premiums. While the Directors have deemed it expedient to exclude Proprietors and Factors named on the Committee, or acting in the absence of Proprietors, from competing for the *Money Premiums* in certain Districts where it is apprehended that the superiority of their stock might discourage competition on the part of the Tenantry, they are fully impressed with the advantages of having such stock exhibited at the District shows, and have offered the Honorary Silver Medal of the Society for the best Bull exhibited at the Competition, should he be the property of one in that class, and superior to the Bull to which the highest Money Premium is award-

ed. A Bull which, as the property of a Proprietor, may have gained the Honorary Medal, will be allowed to compete in a future year, for the highest Money Premium, when *bona fide* the property and in the possession of a Tenant, provided it should have continued the Proprietor's property for at least one year after the award of the Medal, and shall have afterwards been the Tenant's property and in his possession from the day fixed by the regulations (20th May). A Bull which may have been purchased by two or more Tenants for the use of their stocks will be allowed to compete, although the exhibitors may not be joint tenants.

7. In order to entitle the Competitors to their respective Premiums, a regular Report, signed by the Convener, and at least a majority of the Committee who attend the Competition, must be transmitted by the Conveners, so as to be received by the Secretary on or before the 10th of December next, and which Report must specify the ages of the Bulls and Queys preferred; the length of time the Bulls have been in the possession of the Competitors; and, with respect to the Queys, that they were bred by the Competitors, except in the 12th District, and were their property on the day of Competition; the number of Bulls and Queys respectively produced thereat; the number placed for Competition in each Class; the names and designations of the Persons to whom the Premiums have been adjudged; amount of Premiums voted to each; and, in general, that all the Rules of Competition fixed by the Society, as above mentioned, have been strictly observed; and, in particular, that the previous intimations to the Committee of Judges, and advertisements at the church doors, were regularly made as required. In case all the Members of the Committee who may have attended shall not have subscribed the Report, the Convener will mention the cause which may have prevented their doing so.

Further, it is to be distinctly understood, that in no instance does any claim lie against the Society for expenses attending a Show of Stock, beyond the amount of the Premiums offered.

With reference to the Competitions in the 1st, 2d, 5th, 6th, and 12th Districts, the Reports must bear that the Bulls and Queys preferred were of the West Highland breed; in the 11th and 16th, of the Fifeshire breed; and in the 7th, 9th, 13th, and 14th, of the Aberdeenshire breed, the 7th being limited to the Polled Aberdeenshire. A portion of the Premiums in the 15th District is authorized to be assigned to Stock of the Short-horn breed, and a portion to the Ayrshire breed.

Conveners are requested to get the Reports drawn up and signed by a majority of the Committee present at the Competition before they separate.

NOTE.—The Society, impressed with the benefit to be derived from continuing those Competitions in the same Districts for a longer period than was formerly the practice, gives the Premiums for three Competitions in alternate years; and provided the Gentlemen of the District, or any Local Association therein, shall have continued the Competitions, and have awarded Premiums in the District to an amount not less than one-half the Society's Premiums, and for the same description of Stock, during the two intermediate years, the Society continues its Premiums to the District for an additional year. By this arrangement, each District may have the benefit of six Competitions. In Districts Nos. 1, 2, and 3, 1834 was the first year's Competition; Local Premiums were awarded in 1835 and 1837, and this year they have the sixth or additional year's Competition. In Districts 4, 5, 6, 7, and 8, 1835 was the first year's Competition; and this year these five Districts have the Society's Premiums, which will be again given in 1840 to such of them as shall have awarded Local Premiums in 1836 and 1838. In District

No. 9, 1837 was the first year's Competition, and it awarded Local Premiums in 1838. In the District No. 10, this is the first year's Competition for the Society's Premiums; it will be entitled to the Society's Premiums in 1841 and 1843, and also in 1844, if it award Local Premiums in 1840 and 1842. In Districts Nos. 11 and 12, 1836 was the first Competition; they had the Society's Premiums in 1838, and will again have them in 1840, and also in 1841, if they shall have awarded Premiums in the intermediate years. In Districts 13, 14, and 15, 1838 was the first Competition; and they will again have the Society's Premiums in 1840 and 1842. If they award Premiums in the intermediate years, they will have the Society's Premiums for the additional year in 1843. The Districts Nos. 16 and 17 are now offered for 1840 as the first year's Competition, and the Premiums will be continued in 1842 and 1844, and if the Districts give Premiums in 1841 and 1843, the Society's Premiums will be again given in 1845. Farther, in order to encourage the Show for the Local Premiums, the Society, in those Districts in which the Honorary Silver Medal is given, will continue it in the two intermediate years, under the same conditions as during the years when the Society's Premiums are given. A certificate of the Competition and Premiums awarded at the intermediate Local Shows in the several Districts, signed by at least two Members of the Society, must be transmitted to the Secretary of the Society, so as to be received by him on or before the 10th December in each year, in order to entitle the Districts to any claim for the additional year's Premiums.

## § II. WORK HORSES.

### PREMIUMS FOR IMPROVING THE BREED OF DRAUGHT-HORSES.

1. *West Tiviotdale—Roxburghshire.*
2. *The Rhinns of Galloway—Wigtonshire.*
3. *The Upper and Middle Wards of Lanarkshire.*
4. *The District of Kintyre—Argyllshire.*

In each of the above districts Twenty-five Sovereigns will be given by the Society, a sum not less than Twenty Sovereigns additional being given by the resident Gentlemen or by Local Societies, for the improvement of the breed of Draught-Horses. The Premiums to be as follow:—

For the best Stallion, not under three years and nine months, and not exceeding twelve years old, kept exclusively for the improvement of the breed of Draught-Horses, within each of the said Districts, Nos. 1 and 2, and for this purpose to be shewn after the Premiums have been awarded at such stations as may be fixed by the Conveners and Committee of Members of the Society resident in the respective Districts, for service of not more than seventy Mares, at a rate not exceeding One Sovereign for each, at such times between the 1st April and the 1st August 1839, as the respective Committees may fix, at meetings to be called by the Conveners for the purpose—Twenty-five Sovereigns.

For the best Mare for breeding Draught-Horses, not exceeding

twelve years old, and which shall have had at least one foal, *bona fide* the property and in possession of any Tenant in each of the said Districts Nos. 1 and 2, from 1st January 1838 to the day of Competition—Ten Sovereigns.

For the best entire Colt, not exceeding forty-five months old, *bona fide* the property of any Proprietor or Tenant in the said Districts Nos. 1 and 2—Ten Sovereigns.

**NOTE.**—The Premium to the best Stallion must be awarded under the condition, that the Prize Mare, and the Mare which shall be declared by the Judges next in merit, shall have a preference of service by the Prize Stallion, free of charge; all the competing Mares to have a preference over other Mares to service by the Prize Stallion, on such terms and conditions as the Local Committee shall fix, but the charge in no case to exceed the sum indicated by the terms of the Premium. Evidence must be produced that the Prize Stallion has had produce.

#### RULES OF COMPETITION.

The time and place of Competition for the Premiums are to be fixed by the Conveners (the place of Competition for the third District to be within the Upper Ward), with the concurrence of at least a quorum of the Committee, and are to be published by the Conveners in due time at the church doors, or in such other manner as shall be thought by them, and a quorum of the Committee, effectual for the information of those interested.

The Competition will take place in the first and second Districts betwixt 20th March and 1st May 1839, and in the third and fourth Districts within the same period in 1840. The regulations for Cattle Shows, in regard to fixing the Competitions—the previous intimation to the Committee and Competitors—the recommendation to the Committee to take assistance of practical men as Judges—the power of the Committee to withhold the Premiums, if the animals produced shall be of inferior character—those relating to extra expenses, and against Competitors being also Judges—and the manner in which the Reports are to be certified and transmitted to the Society, are severally hereby declared applicable to the Premiums for Horses.

The Premiums now intimated are for the second Competition in the Districts Nos. 1 and 3, and for the first Competition in the Districts Nos. 2 and 4. The expediency of continuing the Premiums for another year in the two last-mentioned Districts is open for consideration, provided the Districts shall respectively propose again to guarantee a sum equal to what they now contribute.

The Members of the Society in the respective Districts are appointed Committees for regulating every thing relative to the Competitions, with power to name Sub-Committees of their number, for attending to the necessary details.

**FOR THE FIRST DISTRICT**—His Grace the Duke of Buccleuch, in his absence Allan Elliot Lockhart, Esq. of Cleghorn, to be Convener of the resident Members; three a quorum of the Committee.

**FOR THE SECOND DISTRICT**—The Right Hon. the Earl of Galloway, in his absence Colonel Hunter Blair of Dunskey, to be Convener of the resident Members; three a quorum of the Committee.

**FOR THE THIRD DISTRICT**—The Right Hon. Lord Belhaven and Sir Norman Macdonald Lockhart, Bart., or either of them, to

be Conveners of the resident Members; in their absence, Mr Rennie Scott, Factor to Lord Douglas, to be Convener; three a quorum of the Committee.

FOR THE FOURTH DISTRICT—Richard Campbell, Esq. of Auchinbreck, and John Lorne Stewart, Esq. of Glenbuckie, or either of them, to be Conveners of the resident Members; three a quorum of the Committee.

### § III. SHEEP AND WOOL.

#### PREMIUMS FOR IMPROVING THE BREED OF SHEEP IN THE FOLLOWING DISTRICTS.

1. *The Districts of Morven, Ardnamurchan, Kingerloch, and Ardgower, Argyllshire.*
2. *The Districts of Badenoch and Rothiemurchus in Invernesshire.*
3. *The Isle of Skye, in the County of Inverness.*
4. *The District of Cowal, Argyllshire.*

For the best six Tups of the Black-faced breed, not exceeding four years old, the property of any Proprietor or Tenant in each of the said Districts, Nos. 1 and 2, which shall be certified at the Competition to belong to a flock of not less than 120 Ewes, and to have been no otherwise grazed or fed during the last season than the Exhibitor's Tups of the same age, and to have served the Ewes of the flock in the same manner, and at least for one month of the season—Six Sovereigns.

For the second best six ditto—Four Sovereigns.

For the best six Tups of the Cheviot breed, not exceeding four years old, the property of any Proprietor or Tenant in the said District No. 1, certified as aforesaid—Six Sovereigns.

For the best Pen of eighteen Gimmers or Ewes of the Black-faced breed, from sixteen to twenty months old, the property of any Proprietor or Tenant within each of the said two Districts Nos. 1 and 2, and which shall be certified at the Competition to have been at least one year in his possession, and to have been, during that year, grazed on the same kind of pasture with the remainder of the flock of the like age—Six Sovereigns.

For the second best Pen as aforesaid—Four Sovereigns.

Premiums for Tups and Gimmers of the Cheviot breed will be given in the District No. 3 similar to those intimated for the Black-faced breed in the said Districts Nos. 1 and 2.

The following Premiums will be given in the District No. 4.



For the best six Tups of the Black-faced breed, not exceeding four years old, the property of any Proprietor, or of any Tenant in the Cowal District, paying *more than L.150* of yearly rent, which shall be certified at the Competition to have been no otherwise grazed or fed during the last season than the Exhibitor's Tups of the same age, and to have served the Ewes of the flock in the same manner, and at least for one month of the season—Five Sovereigns.

For the best six Tups of the Black-faced breed, not exceeding four years old, the property of any Tenant in the said last-mentioned District paying *not more than L.150* of yearly rent, which shall be certified as aforesaid—Five Sovereigns.

For the best Pen of eighteen Gimmers or Ewes of the Black-faced breed, from sixteen to twenty months old, the property of any Proprietor, or of any Tenant within the said last-mentioned District paying *more than L.150* of yearly rent, which shall be certified at the Competition to have been at least one year in his possession, and to have been, during that year, grazed on the same kind of pasture with the remainder of the flock of the same age—Five Sovereigns.

For the best Pen of eighteen Gimmers or Ewes of the Black-faced breed, from sixteen to twenty months old, the property of any Tenant within the said last-mentioned District paying *not more than L.150* of rent, which shall be certified in the same manner as is required in the class last mentioned—Five Sovereigns.

The following Members of the Society are appointed a Committee for awarding the Premiums:—

FOR THE FIRST DISTRICT—Sir James Milles Riddell, of Ardnarmurchan, Bart.; Sir Charles Gordon of Dimnin, Kt.; Charles Henry Forbes, Esq. of Kingerloch; John Gregorson, Esq. of Ardtornish; Colonel Maclean of Ardgower; Dr MacLaine of Killundin; Colin MacLachlan, Esq. Laudle; Euan MacLachlan, Esq. Liddesdale; John Sinclair, Esq. of Lochaline; Alexander Stewart, Esq. of Glencribisdale; *and any other Members in the District, three a quorum*—Sir James Milles Riddell, Bart., in his absence, Mr Gregorson, to be Convener.

The Committee for the 2d District was named in the advertisement of last year, and the Committees for the 3d and 4th Districts will be intimated in 1840.

FOR THE SECOND DISTRICT—Cluny Macpherson; in his absence Major Macpherson, Glentruim, Convener.

FOR THE THIRD DISTRICT—Lord Macdonald and Norman Macleod, Esq. of Macleod, Conveners; in their absence, their Factors are authorized to act.

FOR THE FOURTH DISTRICT—Robert MacLachlan, Esq. of MacLachlan; in his absence, Alexander Lamont, Esq. of Knockdow, Convener.

#### RULES OF COMPETITION.

The Competition for the Premiums in the first District will take place at Strontian on such days between the 1st of June and the 1st of November 1839, as shall be fixed by the Convener, with the advice of a quorum of the Committee. In the second, third, and fourth Districts, the Competitions will take place within the same period in 1840.

It is recommended to the Committee, as in the case of Cattle Competitions, to take the assistance of practical men as Judges in awarding the Premiums. The Judges, in deciding the Premiums for Sheep, will have regard both to the wool and carcass of the animal. The regulations for Cattle Shows, in regard to the previous intimations to Judges and Competitors—the placing of the Stock, and the number of Competitors required for Competition—the power to make provisionally an allowance for Stock of merit in the event of deficiency in number, and prohibiting Members acting as Judges who are also Competitors—the regulations relating to extra expenses—and the manner in which the Reports are to be certified and transmitted, are severally hereby declared to be applicable to the Premiums for Sheep.

The Note annexed to the rules of Competition for the Premiums for Cattle is also applicable to the Premiums for Sheep, which will be continued by the Society for an additional period, in the several Districts on the conditions specified in the said Note. In the first District this is the second year's Competition, and it will be entitled to the fourth or additional year's Premiums in 1842, if it shall have awarded Local Premiums in 1838 and 1840. In the Second District, 1840 will be the third year's Competition for the Society's Premiums; it awarded Local Premiums in 1837, and if it award these also in 1839, it will have the Society's Premiums in 1841, as the additional year. In the Third and Fourth Districts, 1840 will be the first year's Competition. They will have the Society's Premiums again in 1842 and 1844; and if they award Local Premiums in 1841 and 1843, they will have the additional year in 1845.

#### § IV. SWINE.

##### PREMIUMS FOR IMPROVING THE BREED OF SWINE.

1. *The District of Fettercairn, Kincardineshire.*
2. *The Islands of Orkney.*

For the best Boar, not under twelve months, and not exceeding four years old, *bona fide* the property and in possession of any Proprietor or Tenant in the first District, in autumn 1839—Seven Sovereigns.

For the second best—Three Sovereigns.

For the best Breeding Sow of the same age—Four Sovereigns.

For the second best—Two Sovereigns.

These Premiums to be awarded for animals that are considered most profitable, and best suited for the purpose of curing mess Pork. Attention is recommended to the introduction of the Berkshire or Suffolk breed of Swine, as being the best for curing Pork. Similar Premiums will be given in the second District in 1840.

The Competitions are to be held at such times and places as the

Society's Members resident in the Districts shall fix at a meeting to be intimated by the respective Conveners for the purpose. This meeting is also authorized to name a Committee for managing all details, and to fix the necessary regulations for Competition. A Report of the award of the Premiums, with a copy of the Regulations of Competition, to be transmitted to the Secretary on or before the 10th of December 1839 for the first District, and by the same date in 1840 for the second District.

FOR THE FIRST DISTRICT—The Right Hon. Viscount Arbuthnot; in his absence, Sir John Stuart Forbes of Pitsligo and Fettercairn, Bart. to be Conveners.

FOR THE SECOND DISTRICT.—James Baikie, Esq. of Tankerness; in his absence, Charles Sheriff, Esq. Sheriff-Substitute of Orkney, to be Conveners.

## CLASS VII.

### PRODUCTS OF LIVE STOCK.

#### § I. CURING BUTTER.

##### DISTRICTS,

1. *The County of Caithness.*
2. *The Islands of Zetland.*
3. *The Counties of Stirling and Clackmannan, and that part of the County of Perth which is under the jurisdiction of the Sheriff-Substitute of the Dunblane District.*

The Premiums given, and regulations suggested, for promoting an improved system of Curing Butter, having been productive of highly satisfactory results, the following Premiums are offered in the First and Second Districts in 1839.

To the owner of any Dairy in the said First and Second Districts who shall make and cure the best quality of Butter for the market, not being less than two cwt. (112 lb. to the cwt. and 16 oz. to the lb.) during the season 1839—Six Sovereigns.

For the second best quality, as aforesaid—Four Sovereigns.

For the third best quality, as aforesaid—Three Sovereigns.

For the fourth best quality, as aforesaid—Two Sovereigns.

The Society, in 1836, and 1838 gave similar Premiums in the Dunblane, &c. District, comprehending a considerable part of the said district No. 3. These Premiums having been attended with very beneficial effects, the Society, on the application of the General Agricultural Association for Stirlingshire, has resolved to give farther encouragement, and it has accordingly voted Five Sovereigns,

on condition that the Association gives a sum of Ten Sovereigns for Butter Premiums in the said District No. 3.

#### CONDITIONS.

The Butter in the several Districts must be certified to have been made and cured on the Competitor's farm during the season 1839; and the certificate must be supported by the declaration of the Exhibitor, which must further bear, where a sample only is produced, that it is a fair average of the quantity made and cured as aforesaid. It shall be inspected by a Committee of the Members of the Society resident within the district. The Committee, at any meeting to be called by the Convener for that purpose, shall fix such general regulations as they may consider proper; and they will, in particular, fix the place and day of Competition, and the quantity of Butter to be produced by Competitors, which may, as the Committee shall see fit, be either the whole quantity made and cured, or what may be considered a fair specimen. In the latter case, it is suggested as proper to be required, that a firkin made in each of the three months of July, August, and September, shall be exhibited. In the third District, the Committee are empowered to fix the amount of the several Premiums. The quality of the Butter to be tested by judges to be named by the Committee, in the way usually done by purchasers in the public market. In the event of two or more competing lots being deemed equal in quality, the Premium will be awarded to the larger quantity. Although not required as a condition, it is strongly recommended, as affording facilities for sales, that the Butter should be packed in firkins, containing 56 lb., each, or in earthen vessels which have not been glazed with preparations of lead, and of such size as may be suitable for sales. The successful candidates, before receiving the Premiums, are required to transmit to the Secretary a detailed report of the whole process followed by them in the manufacture of their Butter. Reports of the award of the Premiums in the several Districts to be lodged with the Secretary of the Society, on or before the 10th December 1839.

James Traill, Esq. of Ratter, in his absence, William Horne, Esq. of Scouthell, and James Sinclair, Esq. of Forss, or either of them, to be Conveners in the First District; John Bruce, Esq. of Sumburgh, to be Convener in the Second District; and the Preses of the General Agricultural Association for Stirlingshire to be Convener in the Third District.

#### 2. MAKING CHEESE.

The Society having for a series of years given Premiums in the Dairy Districts of Scotland for the most approved descriptions of Cheese, with results highly satisfactory, specimens, at remunerating prices, having been produced of superior quality, of the finer descriptions of Cheese, which it had been supposed could not be successfully made in Scotland, it has been resolved to give further encouragement to bring forward superior Cheese, by offering Premiums open to all Scotland as follows:—

#### PREMIUMS.

1. For the best Cheese of the quality denominated Double Gloucester—Eight Sovereigns, or Plate of that value.
2. For the best Cheese of the quality denominated North Wiltshire—Eight Sovereigns, or Plate of that value.
3. For the best Cheese of the quality denominated Cheshire—Eight Sovereigns, or Plate of that value.

4 For the best Cheese of the quality denominated Stilton—Eight Sovereigns, or Plate of that value.

5. For the best Cheese made from Skim Milk—Eight Sovereigns, or Plate of that value.

6. For the best Cheese of any variety differing in taste and flavour from the kinds above specified, and not of the description denominated Dunlop, the manufacture of which is sufficiently known—Eight Sovereigns, or Plate of that value.

#### CONDITIONS.

The several varieties above mentioned to be made in 1839, with the exception of Classes 3 and 4 (Cheshire and Stilton), which must, as formerly intimated, have been made in 1838. Intending Competitors must lodge, with any Member of the Society in their neighbourhood, before the 1st of June next, a memorandum specifying the description or descriptions of Cheese for which they intend to compete, and the quantity must not be less than 1 cwt. of any variety. Each competitor must lodge with the Secretary, at the Society's Hall, on or before the 10th of December 1839, specimens of the Cheese for which he is to compete, of not less than 16 lb. imperial weight, in not more than two cheeses, accompanied by a declaration that the specimens are fair average samples of the whole cheese made by the competitor during the season, of the description for which he competes. In Class 5 the declaration must bear, that neither cream nor uncreamed milk has been used, and that the milk had not stood less than twelve hours before the cream was taken off. The declaration in the several classes to be sealed, and to bear upon the envelope a motto or mark corresponding to the distinguishing mark upon the cheese, to which it has reference.

The successful Competitors, before receiving payment of their premiums shall, if required, transmit to the Society a detailed report of the whole process employed by them in the manufacture of their cheese.

The parties who gained the Premiums in Classes 1, 2, 5, and 6, at the Competition in Edinburgh in 1838, will not be allowed to compete for the Premiums now offered in these Classes.

Members of the Society, to whom intimation may be given by intending competitors, are particularly requested to visit the dairies during the season, and to report upon them, and particularly upon the progress made in cheese making in general in their district since the Society first directed attention to this important object.

### CLASS VIII.

#### COTTAGES.

##### 1. PREMIUMS FOR THE BEST KEPT COTTAGES AND GARDENS.

In order to encourage Cottagers to keep their cottages and gardens neat and clean, the following Premiums will be given in the parishes after mentioned.

##### *Lanarkshire.*

PARISH OF CULTER.—Convener R. G. Baillie, Esq. of Coulterallers.

PARISH OF AVONDALE.—Convener, Robert Brown, Esq. Hamilton.

THE PARISH OF CARLUKE.—Convener, William Lockhart, Esq. of Milton-Lockhart.

THE PARISH OF DALSERF.

*Fifeshire.*

PARISH OF KINGHORN.—Convener, The Earl of Rosslyn.

PARISH OF SCOONIE.—Convener, Major Anderson of Kingask.

PARISH OF MARKINCH.—Convener, Major Anderson.

PARISH OF KENNOWAY.—Convener, J. B. Fernie, Esq. of Kilmux.

*Mid-Lothian.*

PARISH OF CARRINGTON.—Convener, the Earl of Rosebery.

PARISH OF CURRIE.—Convener, William Gibson-Craig, Esq. yr. of Riccarton, M.P.

PARISH OF LIBERTON.—Convener, Richard Trotter, Esq. of Mortonhall.

PARISH OF STOW.—Convener, John Borthwick, Esq. of Crookston.

*Selkirkshire.*

PARISH OF SELKIRK.—Convener, Alex. Pringle, Esq. of Whytbank, M.P.

PARISH OF ROBERTON.—Convener, Thomas Stavert, Esq. of Heathcot.

PARISH OF ETTRICK.—Convener, William Ogilvie, Esq. of Chesters.

PARISH OF YARROW.—Convener, Colonel Sir James Russell of Ashiestiel, C.B.

PREMIUMS.

1. For the best kept Cottage in each of the said parishes.—Two Sovereigns.
2. For the second best kept ditto—One Sovereign.
3. For the best kept Cottage Garden in each parish—One Sovereign.

CONDITIONS.

The names of intending Competitors must be intimated to the Conveners appointed by the Society, on or before the 20th April next, otherwise they shall not be allowed to compete. The inspection of the *Cottages and Gardens* to take place between 12th June and 12th August.

In order to authorize the awarding of the Premiums, the annual value of the Cottage of the Competitor, with the ground annexed, must not exceed L.5 Sterling, and there must at least be two Competitors in the District. No Cottage or Garden for which a Premium has been awarded by the Society, will be admitted in competition again for the same or a lower premium. If the Cottage competing is occupied by the proprietor, the roof must be in good repair. If the roof is of thatch, it must be in good repair, though in the occupation of a tenant. The windows must be free of broken glass, and perfectly clean, and must afford the means of ventilation. Dung-hills and all other nuisances must be removed from the front and gables. The peat-stacks, if any, must be so placed as not to be a deformity; and the interior of the Cottage must be as cleanly kept as the nature of the Cottage admits of. In awarding the Cottage Premiums, the preference will be given to those who, in addition to these requisites, have displayed the greatest taste in ornamenting the exterior of their houses, with the ground in front and at the gables.

In estimating the claims of Competitors for the Garden Premium, the Judges will have in view, 1st, The sufficiency and neatness of the fence; 2d, The cleanliness of the ground, and neatness of the walks; 3d, The quality of the crops, and general productiveness of the Garden; and 4th, The choice of crops. Much advantage is derived in some districts in Scotland from Cottagers cultivating, besides the more common crops, a portion of early potatoes along with the late,

of early cabbage, early pease, cauliflower, lettuce, with some gooseberry and currant-bushes, and a fruit-tree trained against the wall, &c.

Reports stating that the various particulars before mentioned have been attended to, the number of Competitors, the names of the successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary of the Society, on or before the 1st day of September next.

Similar Premiums will be given for four successive years in four parishes in each of the Counties of East Lothian, and Orkney and Zetland, on condition that a satisfactory guarantee for one-half of the amount of the Premiums to be given, shall be lodged by each parish with the Secretary, on or before the 1st of January 1840. The Premiums for these Counties will be competed for in that and three following years. If the guarantees shall be lodged from more than four parishes in any of these Counties, within the time limited, the preference will be given to those which have been first received.

## 2. PREMIUMS TO PROPRIETORS FOR BUILDING COTTAGES.

### 1. *The County of Perth.*

### 2. *The County of Ayr.*

In order to mark the sense which the Society entertains of the advantages likely to result to the country, by Landed Proprietors exerting themselves to improve the style and comfort of Cottages on their estates; and in order to call the attention of such Proprietors to the subject, the Society proposes to give Premiums as undermentioned.

1. To the Proprietor who shall have erected on his estate, during the year 1839, the best and approved Cottage—The Honorary Silver Medal.

2. To the Proprietor who shall erect on his estate, during the years 1839–40–41 and 1842, the greatest number of approved Cottages—The Gold Medal.

The claims of intending Competitors for the Premium No. 1, must be lodged with the Conveners of the Committee of the Society in the said Counties, on or before the 1st of October in each year, otherwise they shall not be entitled to compete; and for the Premium No. 2, in the same manner, on or before the 1st of October in the year 1842. The inspection of the Cottages to take place between the 1st October and the 1st November for the Premium No. 1, and between the same dates in the year 1842 for the Premium No. 2.

Reports by the Conveners to be transmitted to the Secretary of the Society on or before the 30th of November in each year.

In order to authorize the award of the Premiums, the annual value of the Cottage or Cottages separately, with garden-ground, must not exceed L.5 Sterling, and in awarding the Premium No. 2, the Cottage for which the Premium No. 1 has been awarded, shall be deducted from the number.

In estimating the claims of Competitors, the following points will

be kept in view.—1st, The situation of the Cottage with reference to amenity of climate and aspect, and to the means of drainage and of preserving cleanliness. 2d, The suitability of the structure to withstand the effects of the climate of the district. 3d, The accommodation in the interior of the Cottage, and the arrangement of outhouses attached to it. 4th, The small expense of the building compared with its durability, and with the accommodation afforded, and calculated with reference to the price of materials, and other circumstances which may vary in different districts. 5th, The outward appearance of the Cottage or Cottages.

Parties competing to forward plans, specifications, and estimates, to the Society, through the Conveners of the Districts, from which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

The Members of the Society in the respective Counties, or in the neighbourhood of the Cottages competing, are appointed Committees to inspect the Cottages, and report on the claims, with power to name Sub-Committees.

**FOR THE FIRST DISTRICT.**—Sir Neil Menzies of Menzies, Bart. Honorary Secretary of the Society, and Patrick Small Keir, Esq. of Kinmonth, to be Conveners.

**FOR THE SECOND DISTRICT.**—Sir Charles Dalrymple Fergusson of Kilkerran, Bart., and Archibald Hamilton, Esq. of Carcluie, Rozelle, to be Conveners.

**NOTE.**—If the Society find the Premiums practically useful and generally approved of, they will hereafter be advertised for other counties.

### 3. MEDALS TO COTTAGERS.

In the view of giving still farther encouragement to Cottagers of the description referred to under the first branch of this Class, who do not reside in the counties in which the regular Premiums are in operation, and at the same time of giving aid to Local Associations and public-spirited individuals, establishing or continuing at their own expense Premiums for the like object, the Society will give its Cottage Medal to such Associations or public-spirited individuals as apply for the same, and may be desirous to add that testimony of approbation to such Premiums as they themselves bestow. The number of Medals to be issued annually is limited to six.

Applications for these Medals, stating the nature and amount of the encouragement which is to be afforded by the parties applying, to be made to the Society on or before the 1st of July in each year, so that the Association or individual making the application



may be enabled to intimate that the Medals are to be given. The Medals will afterwards be issued upon a Report, certified in the terms required by the preceding conditions, describing the merits of the Cottagers. The Reports to be lodged with the Secretary before the 10th November of the year in which the application is made.

#### 4. PREMIUMS TO COTTAGERS FOR PROMOTING ATTENTION TO THE CULTIVATION AND MANAGEMENT OF BEES.

1. *The Counties of Lanark and Renfrew.*

2. *The Counties of Ayr and Wigton.*

To the Cottager in the 1st District, paying L.5 of rent or under, or whose cottage and land annexed to it does not exceed that annual value, who, between the 1st of June and 1st October 1839, shall have raised the greatest number of Hives of Bees, not fewer than seven, from stocks of his or her own property, none of the hives weighing under 20 lb. exclusive of the weight of the material of the hive or skep—A Premium of Four Sovereigns.

To the Cottager in the same District who shall have raised the second greatest number as aforesaid—Three Sovereigns.

To the Cottager in the same District who shall have raised the third greatest number—Two Sovereigns.

To the Cottager in the same District who shall have raised the fourth greatest number—One Sovereign.

Certificates of the number of Hives, and their several weights, making allowance for the weight of the skeps (which must be weighed before being used), signed by two Members of the Society resident in the neighbourhood, or by one Member and the Clergyman of the Parish, to be transmitted to the Secretary on or before the 10th November 1839.

Similar Premiums will be given in the Second District for Hives raised between the 1st June and 1st October 1840.

CONVENERS FOR LANARKSHIRE—William Lockhart, Esq. of Milton Lockhart, Middle Ward; Andrew Buchanan, Esq. of Mount Vernon, Lower Ward; and Mr Rennie Scott, Factor to Lord Douglas, Upper Ward.

CONVENERS FOR RENFREWSHIRE—R. Cunningham Bontine, Esq. of Ardoch; and Claud Marshall, Esq. Sheriff-Substitute, Greenock.

*In order that the Premiums offered may be made known to the industrious Cottagers, the Society trusts much to the obliging co-operation of the Clergy in the Counties in which the Cottage Premiums are offered.*

## CLASS IX.

### WOODS AND PLANTATIONS.

#### 1. HONORARY PREMIUM FOR EXTENSIVE PLANTING.

To the Proprietor who shall, within a period of five years immediately preceding, have planted on his property the greatest extent of ground, not being less than 300 acres, and who shall communicate to the Society, on or before the 10th of November in any year, a satisfactory report of his operations, embracing the expense, description of soil, age, and kind of trees planted, the number of each sort per acre, mode of planting, extent of "beeting up," and general progress of the plantation, with such observations as his experience may suggest—The Gold Medal.

#### 2. REPORTS ON RECENT PLANTATIONS.

To the Proprietor who shall communicate to the Society, on or before the 10th of November in any year, the most satisfactory Report on the Planting of Land, founded on experiment; and who shall, accordingly, have planted on his own property an extent of not less than fifty acres, within a period of not more than ten nor less than four years preceding the date of his Report—The Gold Medal.

The Report should comprehend every interesting particular; among others, the exposure and altitude of the place, and general character of the soil—the mode of fencing and of planting adopted—the kind of trees planted, and the number of each kind per acre—their relative progress—the proportion of blanks or deaths at the end of three years—the state of the plantations at the date of making the report, and the expense per acre, as nearly as can be calculated.

#### 3. NATIVE FIR WOODS.

For the best and approved account of any of the Districts of Scotland where the *Pinus sylvestris* is indigenous, and abounds so as to constitute a native forest—The Honorary Silver Medal.

The Society has already received a Report on the Glenmore, Duthill, Rothiemurchus, and Abernethy Forests, which has been published in its Transactions. Competitors will avoid giving the same information as is there contained.

It will be expected that a view should be given both of the past and present state of the woods to which the Report has reference, and of the nature of the situations, and of the soil and subsoil where the trees appear to thrive best. It will be de-

sirable also that measurements of some of the largest trees should be given, and a statement of their age, as far as it can be ascertained, by counting the rings or annual layers on felled trees of similar dimensions. The comparative growth of any other native trees which occur in the District, such as Birch or Oak, should be mentioned, and the undergrowth and general state of the pasture herbage should be described. Any circumstances which may appear to the writer likely to throw light on the growth and management of native fir woods, should be adverted to; and, in particular, how far the observation is well founded, that the best trees have a northern exposure, or are found in woods having a north aspect or inclination.

#### 4. FIR PLANTATIONS.

For the best and approved account of the Fir Woods in any District of Scotland to which the *Pinus sylvestris* is not indigenous, including the various particulars specified under the said Premium No. 3.—The Honorary Silver Medal.

#### 5. COLLECTING THE SEEDS OF THE SCOTS FIR OR *PINUS SYLVESTRIS* FROM NATIVE TREES IN SCOTLAND.

To the person in Scotland who shall, between 30th October 1836 and 30th October 1840, have collected and sown, or sold for sowing, the greatest quantity of seeds of the Scots Fir or *Pinus sylvestris* from healthy and free-growing trees of natural growth, in the Highland Districts of the Counties of Aberdeen, Moray, Inverness, or Perth, the quantity to be not less than 1500 lb. clean seed—The Gold Medal, or a piece of Plate of that value.

Competitors to transmit to the Secretary of the Society, on or before the 10th of November 1840, a declaration in support of the collection of the seed from proper trees, specifying the quantity collected in each year, and the district where it was gathered, stating also whether the seed had been sown or sold, and in the latter case the name of the purchaser. The expense of collecting, and, if sold, the price obtained, should likewise be reported.

#### 6. IMPORTING THE SEEDS OF THE *PINUS SYLVESTRIS*, COLLECTED FROM TREES IN THE NATIVE FORESTS OF THE CONTINENT.

To the person in Scotland who shall, between the 30th of October 1836 and the 30th of October 1840, have imported from Germany or Switzerland, or from Norway, Sweden, or Russia, and sown, or sold for sowing, the largest quantity of the seeds of the *Pinus sylvestris* (Kiefer, or Föhre, Roför), taken from full-grown healthy trees in those countries, but in no case from trees

situated in the immediate vicinity of the sea, the quantity not to be less than 1500 lb. of clean seeds—The Gold Medal, or a piece of Plate of the same value.

Competitors to transmit to the Secretary of the Society, on or before the 10th of November 1840, evidence (the best that can be obtained) in support of the collection of the seed from proper trees, specifying the District where it was collected, and the commercial firm through whose means it was imported; also whether it had been sown in this country by the importer, or sold for that purpose, and, in the latter case, the name of the purchasers. The cost price, and, if sold, the price obtained, to be also stated.

**7. INTRODUCTION OF NEW AND EXTENDING THE CULTIVATION OF THE RARER USEFUL FOREST-TREES IN SCOTTISH PLANTATIONS.**

To the person who shall, on or before the 30th of October in any year, report to the Society the successful introduction into Scottish Plantations, of any new ornamental or useful Forest-Tree, or the successful extended cultivation of any of the rarer useful sorts already known, but which have not hitherto received the attention which their merits would warrant—The Silver Medal, or a piece of Plate of such value as the communication may be adjudged to deserve.

Attention is more particularly directed to such trees as will grow in situations unfavourable to the health of the more generally known sorts, as elevated mountains, peaty and sandy tracts, exposed marine situations; and in regard to the last of these, it is especially wished to ascertain the value of the *Pinus pinaster*, or the *Pinus maritima major* of the French.

Satisfactory evidence will be required, that the tree reported upon is of new or recent introduction, or that it has not hitherto received that extended cultivation which, from its value, it may have merited; and that the soil and situation for which it is recommended are congenial to its habits. A particular account of its nature and habits, nursery, and after management, uses and value of its timber, or effect in landscape scenery; and, if new, an account of its introduction must be furnished, accompanied by a specimen of the branches and foliage, and, if possible, a specimen of the wood, and also of its fruit.

**8. INTRODUCTION OF FOREST-TREES NOT YET KNOWN IN A LIVING STATE IN SCOTLAND.**

To the person who shall, in any year, most successfully transmit to the Society, in a state fit for germination, seeds of Forest Trees not yet in cultivation in this country, and which are natives of

such places as, from their latitude or altitude, may be expected to produce trees hardy in the climate of Scotland—The Gold or Silver Medal, or a piece of Plate of such value as the Directors, in the circumstances of the case, may think suitable.

The Society would particularly wish to direct (but by no means to confine) attention to the Fir tribes; and the countries from which contributions are particularly expected are the north-west part of America, the table-land of Mexico, such parts of the Andes as have sufficient elevation, and the Himalaya Mountains, or the great plains to the northward of them. The seeds may be sent home in the cones, wrapped in brown paper, packed in a box, and kept in a cool, airy part of the cabin, but by no means in the hold, nor in close tin cases. If Competitors possess the means, by themselves or their correspondents, of trying their vegetation in this country, it will be desirable that they should do so; but otherwise, if the seeds be sent to the Secretary of the Society, they will be tried under the direction of the Society, so as to afford every chance of success. The transmission of living plants in boxes, or in cases covered with glass panes, may be attempted where practicable; the external air should be excluded, and almost no water given during the voyage. Where this plan is adopted, smaller seeds, berries, or hops, may be thickly mixed with the soil or earth in which the plants are placed.

#### 9. MORE EXTENDED INTRODUCTION OF KNOWN SPECIES OF THE FIR TRIBE.

To the person who shall, within five years from 1835, inclusive, have introduced from any part of the world, Cones containing seeds capable of germination, the produce of hardy species of the Fir Tribes which have been already introduced into Britain, but of which only a few plants have been raised—The Gold or Silver Medal, or a piece of Plate of such value as the Directors may, in the circumstances of the case, deem adequate.

It is required that the quantity of cones of each species imported shall be sufficient to afford at least 500 seedling plants; and farther, that before the Premium be awarded, the number of seedling plants of each species actually raised in Scotland shall not be less than 100. Attention is particularly directed to *Araucaria imbricata*, *Pinus ponderosa*, *Lambertiana*, and *Sabiniana*; to *Abies Douglasii*, *nobilis*, *grandis*, and *Menziesii*; and to *Taxodium sempervirens*, which last is abundant in the vicinity of St Francisco, and throughout the low sandy plains of California. Reports to be lodged by 10th November 1841.

CLASS X.  
GENERAL SHOW OF LIVE STOCK,  
AND

AGRICULTURAL MEETING AT INVERNESS IN 1839.

The Society having resolved to hold the General Show of Live Stock and Agricultural Meeting for 1839, at Inverness, the following Premiums are offered to be then awarded, aided by liberal donations from the town and county of Inverness, and adjoining counties.

§ I. CATTLE.

WEST HIGHLAND BREED.

I. For the best Bull, calved between 1st January 1833 and 1st January 1837—Twenty Sovereigns.

For the second best ditto—Ten Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

It is a condition attached to the Premiums in this Class, that the Exhibitors shall be obliged to let out, in the season 1840, the Prize Bulls, to serve at least forty Cows, at such places in the Districts more immediately connected with the Show as the Committee shall fix, on payment of Five Shillings for each Cow. The owner, if resident within the District, to have preference of service for his own stock.

II. For the best Bull, calved after 1st January 1837—Seven Sovereigns.

III. For the best two Heifers, calved after the 1st January 1837—Five Sovereigns.

IV. For the best Breeding Cow, calved between 1st January 1831 and 1st January 1835—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

For the third best ditto—Three Sovereigns.

V. For the best two Oxen, calved after 1st January 1835—Ten Sovereigns, or Plate of that value.

VI. For the best two Oxen, calved after 1st January 1836—Seven Sovereigns, or Plate of that value.

VII. For the best two Oxen, calved after 1st January 1836, which have never been housed nor {confined in the straw-yard since Whitsunday 1837—Ten Sovereigns.

VIII. For the best lot of Stot Stirks, not fewer than six, calved after 1st January 1838, bred by the Exhibitor—Seven Sovereigns

IX. For the best lot of six Queys, calved after 1st January 1838, bred by the Exhibitor—Seven Sovereigns.

SHORT-HORN BREED.

X. For the best Bull of the pure short-horn breed, calved after 1st January 1832—Twenty Sovereigns.

For the second best ditto—Ten Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

A similar condition is attached to the Premiums in Class 10, as above intimated for Class I. Ten Shillings and Sixpence to be paid for each Cow.

XI. For the best Bull Stirk, calved after the 1st of January 1838—Seven Sovereigns.

XII. For the best Heifer, calved after the 1st of January 1838—Five Sovereigns.

XIII. For the best Cow of any age—Ten Sovereigns.

XIV. For the best Cow, calved after 1st January 1835—Eight Sovereigns.

For the second best ditto—Five Sovereigns.

XV. For the best Ox of the same breed, calved after 1st January 1837, bred by the Exhibitor—Seven Sovereigns.

XVI. For the best two Heifers, calved after 1st January 1837—Seven Sovereigns.

ABERDEEN, ANGUS, AND GALLOWAY POLLED BREEDS.

XVII. For the best Bull, calved between 1st January 1832 and 1st January 1837—Twenty Sovereigns.]

For the second best ditto—Ten Sovereigns.

For the third best ditto—Five Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal

A similar condition is attached to the Premiums in Class 17, as above intimated for Class I.

XVIII. For the best Bull, calved after the 1st January 1837—Seven Sovereigns.

XIX. For the best Cow of this breed, calved between 1st January 1831 and 1st January 1836—Ten Sovereigns.

For the second best Cow—Five Sovereigns.

XX. For the best two Heifers, calved after 1st January 1836—Seven Sovereigns.

XXI. For the best two ditto, calved after 1st January 1837—Five Sovereigns.

XXII. For the best two Oxen, calved after 1st January 1835—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

AYRESHIRE BREED.

XXIII. For the best Bull, calved between 1st January 1832 and 1st January 1837—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

A similar condition is attached to the Premiums in Class 23, as above intimated for Class 1.

XXIV. For the best Bull, calved after 1st January 1837—Five Sovereigns.

XXV. For the best two Heifers, calved after 1st January 1837—Five Sovereigns.

XXVI. For the best Cow, calved after 1st January 1831—Seven Sovereigns.

For the second best ditto—Five Sovereigns.

ANY BREED.

XXVII. For the best pair of fat Oxen, of any breed except the Short-horn, calved after 1st January 1835—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

CROSSES.

XXVIII. For the best two Oxen, a first-cross between a short-horn Bull and an Aberdeenshire horned Cow, calved after 1st January 1837—Ten Sovereigns.

XXIX. For the best two ditto, calved after 1st January 1836—Five Sovereigns.

XXX. For the best two Oxen, a first-cross between a Bull of the Short-horn breed and an Aberdeenshire polled Cow, Angus polled Cow, or Galloway polled Cow, calved after 1st January 1837—Ten Sovereigns.

XXXI. For the best two ditto, calved after 1st January 1836—Five Sovereigns.

XXXII. For the best two Oxen, cross between the short-horn Bull and West Highland Cow, calved after 1st January 1835—Ten Sovereigns.

XXXIII. For the best two ditto, calved after the 1st January 1836—Five Sovereigns.

XXXIV. For the best two Oxen of any cross, except [those



above specified, calved after the 1st January 1835—Ten Sovereigns.

XXXV. For the best two ditto, calved after the 1st January 1836—Five Sovereigns.

#### § II. HORSES.

CLASS I. For the best entire Horse for agricultural purposes, not under five years, and not exceeding eight years and six months old, bringing evidence of having had produce in the former year—Twenty-five Sovereigns, or Plate of that value.

For the second best ditto—Fifteen Sovereigns.

II. For the best entire Colt for agricultural purposes, not exceeding four years and six months old—Ten Sovereigns.

Evidence must be produced that the Prize Horses in these two Classes have had produce; and it is a condition attached to the Premiums, that the Exhibitors shall be obliged to let out the Prize Horses for season 1840, to serve within such portion and at such places of the Districts as the Local Committee may fix. The number of Mares to be served by each Horse not to exceed seventy, and the charge to be One Sovereign for each Mare.

III. For the best Breeding Mare for agricultural purposes, having had at least one Foal, and not being under five nor exceeding twelve years and six months old—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

IV. For the best three-year-old Filly for agricultural purposes—Five Sovereigns.

V. For the best two-year-old ditto—Five Sovereigns.

VI. For the best Highland entire Pony, not exceeding fourteen and a half hands high—Ten Sovereigns, or Plate of that value.

VII. For the best Highland Breeding Mare, not exceeding thirteen hands high—Seven Sovereigns.

VIII. For the best Highland Pony for the saddle, not under four and not exceeding seven years and six months old, and not more than thirteen hands high—Five Sovereigns.

IX. For the best pair of three-year-old Colts, said breed, for agricultural purposes—Ten Sovereigns

X. For the best Pony Mare, or Highland Garron, not under thirteen and a half hands, and not exceeding fourteen and a half hands high—Five Sovereigns.

#### § III. SHEEP.

##### BLACK-FACED BREED.

CLASS I. For the best two Tups, not exceeding forty-five

months, which shall have served a hirsle of Ewes in Autumn 1838—Seven Sovereigns.

For the second best two ditto—Five Sovereigns.

II. For the best pen of five Ewes, not exceeding five years and seven months old, selected from a hirsle of a regular breeding stock, not less than 200, and the pen having reared lambs for the season—Six Sovereigns.

For the second best pen of ditto—Five Sovereigns.

III. For the best pen of five Wedders, not exceeding five years and seven months old—Five Sovereigns.

CHEVIOT BREED.

IV. For the best two Tups, not exceeding forty-five months old, and which have served with a hirsle in the autumn of 1838—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

V. For the best pen of five Ewes, not exceeding five years and eight months old, and which have reared Lambs for the season—Seven Sovereigns.

For the second best pen of five ditto—Five Sovereigns.

VI. For the best pen of five Gimmers—Five Sovereigns.

VII. For the best pen of five Wedders, not exceeding four years and eight months old, shewing symmetry, fat, and weight—Five Sovereigns.

For the second best ditto—Three Sovereigns.

VIII. For the best pen of five fat Wedders, not exceeding three years and eight months—Five Sovereigns.

LEICESTER BREED.

IX. For the best Tup, not exceeding four years old—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

X. For the best Shearling Tup—Five Sovereigns.

XI. For the best pen of three Ewes, not exceeding three years and eight months old, and having reared lambs for the season—Seven Sovereigns.

For the second best ditto—Five Sovereigns.

SOUTHDOWN BREED.

XII. For the best Tup, not exceeding four years old—Ten Sovereigns.

XIII. For the best pen of three Ewes, not exceeding three years and eight months old—Seven Sovereigns.

## CROSSES.

XIV. For the best pen of five Wedders, cross between Leicester Tups and Cheviot Ewes, not exceeding three years and eight months—Five Sovereigns.

XV. For the best pen of five ditto, not exceeding two years and eight months—Five Sovereigns.

XVI. For the best pen of five Dinmonts, cross between Leicester Tups and Cheviot Ewes, not exceeding one year and eight months—Five Sovereigns.

XVII. For the best pen of five Wedders, cross between Leicester Tups and Black-faced Ewes, not exceeding three years and eight months old—Five Sovereigns.

XVIII. For the best pen of five Wedders, first cross between Cheviot Tups and Black-faced Ewes, not exceeding three years and eight months old—Five Sovereigns.

XIX. For the best pen of five Wedders of any cross, not exceeding thirty-two months old—Five Sovereigns.

## § IV. SWINE.

CLASS I. For the best Boar—Five Sovereigns.

For the second best ditto—Three Sovereigns.

II. For the best Sow—Five Sovereigns.

For the second best ditto—Three Sovereigns.

III. For the best three Pigs, not exceeding forty weeks old—Five Sovereigns.

For the second best ditto—Three Sovereigns.

NOTE.—In awarding these premiums, attention will be paid to the Breeds most suitable for family use. The name of the Breed to be specified in the Certificate.

## § V. WOOL.

CLASS I. For the best sample of Leicester Wool, shewn by the Breeder of the Stock, not fewer than seven fleeces—Five Sovereigns.

II. For the best sample of Cheviot Laid Wool, shewn by the Breeder of the Stock, not fewer than seven fleeces—Five Sovereigns.

III. For the best sample of Black-faced Laid Wool, shewn by the Breeder of the Stock, not fewer than seven fleeces—Five Sovereigns.

IV. For the best sample of Wool, cross between Leicester Tups and Cheviot Ewes, shewn by the Breeder of the Stock, not fewer than seven fleeces—Five Sovereigns.

V. For the best sample of Wool, cross between Cheviot and Black-faced, shewn by the Breeder of the Stock, not fewer than seven fleeces—Five Sovereigns.

Competitors for these Premiums are required to state the number of sheep of which the flock consisted from which the sample is taken, the gross quantity clipped, whether the fleeces are Ewe or Hog, and, if sold, the price obtained; and, in regard to the Combing Wool, whether it is of the New Leicester, Cotswold, or any cross of these Breeds. The Exhibitors must have bred the stock from which the wool has been obtained.

#### § VI. EXTRA STOCK, IMPLEMENTS, ROOTS, AND SEEDS.

For Extra Stock of any kind, not shewn for any of the above premiums, and not exceeding in one lot five Cattle or ten Sheep, and for Implements, Roots, Seeds, &c. premiums will be awarded and apportioned by the Committee and Judges, in Money, Plate, or Honorary Medals, to the value in whole of Fifty Sovereigns.

#### GENERAL REGULATIONS FOR THE SHOW AT INVERNESS.

1. The Competition will take place at Inverness in the end of September or beginning of October 1839. The particular day will be afterwards intimated.

2. The Competition is open to Stock from any part of the United Kingdom.

3. The name, residence, and post-town of the Exhibitor, the name of the Breed, the number of the class in which the animals are to be exhibited, their age, and, in the case of Fat Stock, the kind of food on which they have been fed, must be regularly certified, and the certificate signed by the Exhibitor, agreeably to the form annexed, must be lodged fourteen days before the day of Exhibition. The pedigree of the Stock, so far as known, must also be given. A list of the Stock entered will be made up by the Secretary fourteen days before the Show, and no Stock will be allowed to compete which is not included in that list.—*Printed forms* of certificates may be had by application at the Society's Hall, Edinburgh; or at Mr Rennie, Solicitor, Inverness.

The Secretary, or his Clerk, will be at Inverness sixteen days before the Show, to answer inquiries, attend to details, and to receive certificates. In the mean time, certificates may be lodged with him at Edinburgh, or with Mr Rennie at Inverness. The certificates so lodged, are not to be communicated to third parties, until after they have been officially laid before the Committee by the Secretary.

4. A responsible person on the part of the Exhibitor, must attend at the Secretary's Office, at Inverness, previous to the day of the Show, to give explanation, if it should be required, to receive orders or warrants of admission for the Stock of which they are in charge, and all necessary instructions in matters of detail, at the competition. The person or persons so attending must be acquainted with the various particulars required to be certified regarding the Stock of which they are in charge, more especially the mode of feeding in the case of Fat Stock; and it shall be competent to the Committee, if they shall see

fit, to require the Exhibitor, or the person in charge of the Stock, to confirm the certificates in presence of a magistrate on the day of competition.

5. In estimating the ages above prescribed for competing Stock, the following rules are to be observed, viz.—The age of cattle, in all the classes, will be calculated from the 1st of January of the year in which they were calved; of horses from the 1st of May of the year in which they were foaled; and of sheep from 1st of March of the year in which they were lambed.

6. It is required that the Stock shall have been *bona fide* the property and in possession of the Exhibitor from 1st May 1839. Evidence must be produced, if desired, that the Stallions and Bulls for which Premiums are awarded, have had produce during the preceding year; provided they are four years old and upwards.

7. Cattle fed on distillery or Brewers' wash or grains, will not be admitted to compete, as such food is not generally accessible to Competitors. Cattle fed on oil or rape cake are not excluded in any class. Cows exhibited for Premiums, must have had a calf, or be in calf, during the year 1839.

8. A ticket or order will be delivered by the Secretary on or before the day preceding the Show to the person in charge of each lot, for its being received into the Show-Yard; and no Stock whatever can come within the premises without such warrant. One servant only for each lot can be admitted, who must afterwards continue in charge of that lot in the Show-Yard. Bulls must be secured by a ring or screw in the nose, with a chain or rope attached, otherwise they cannot be admitted into the Show-Yard. There are screws for temporary use, which competitors will find it convenient to provide for bulls that have not been usually ringed.

9. The distance each animal travels to the Show, and, in the case of Fat Stock, the date of being put to fatten, to be mentioned.

10. A Competitor may shew more than one lot in any class. It shall not be competent to enter a lot in one class, and afterwards to withdraw it for competition in another class, unless by directions of the Committee. An animal having already gained the first premium in his class, at any of the Society's General Shows of Stock, which have been held at Edinburgh, Glasgow, Perth, Dumfries, Inverness, Kelso, Stirling, Aberdeen, or Ayr, is not to be shewn again in competition in the same class, but may be exhibited as Extra Stock.

11. All persons intending to exhibit Extra Stock, must intimate to the Secretary, and describe the Stock, fourteen days before the exhibition. Stock which cannot be shewn in any competing class, may be exhibited as Extra Stock. If any lot of Fat Stock, for which a competing class is open, is to be entered as Extra Stock, from an impression on the part of the Exhibitor that they are too young to compete in the classes open to them, the Judges of Extra Stock are directed to notice them specially, provided they possess merit.

12. The competing Stock will be classed and distinguished by *Tickets or Numbers* to be affixed to each lot, immediately after they are placed in the Show-Yard, corresponding to the list made up by the Secretary;—by this arrangement, the owner's name is not known to the Judges.

13. The Committee of the Society appointed to conduct the arrangements for the Show, will appoint skilful persons to act as Judges. These will be divided into sections, to judge of the Breeds and Stock with which they are best acquainted, and in order to render the inspection short, so as the public may be permitted to enter the Show-Yard as early as possible. The Judges, in forming

their opinion, will particularly attend to the instructions to be delivered for their guidance.

14. A Member of the Committee, or of the Deputation of Directors, will be appointed to attend each section of the Judges, and who, along with the Judges, shall be admitted into the Show-Yard, at ten o'clock precisely. A servant, provided with Tickets, upon which shall be written in legible characters, "First Premium," or "Second Premium," will be in attendance on the Member of the Committee so appointed. The Judges shall immediately proceed to examine and decide on the merits of the Stock; and as soon as a section shall determine which animal or animals are entitled to the Prizes in their respective classes, the Member of the Committee or Deputation of the Directors shall forthwith direct the servant in attendance to affix the prize-ticket on the animal, and the Member of the Committee or Deputation is to be responsible that they are labelled accordingly, in order that the public may have the earliest opportunity to examine the points of the Prize Cattle. When the inspection is finished, the Judges shall sign and give in their Reports to the Committee, and their award shall be final, provided no valid objection is stated against the prize animals' right to compete in their respective classes.

15. To prevent confusion, and to afford the time necessary for placing the Stock in the Show-Yard, the different lots must be brought to the ground at or before eight o'clock in the morning. On their arrival at the gate, instructions will be given as to the particular part of the Show-Yard to be occupied by each class. The Stock will be withdrawn, and the Show-Yard shut at four o'clock.

16. Persons intending to exhibit Implements, Roots, or Seeds, must communicate with the Secretary, and lodge with him a memorandum descriptive of the articles to be shewn, at least five days before the meeting.

Finally, no change can, under any circumstances, be made upon the General Regulations established by the Society for Agricultural Meetings and General Shows of Live Stock, so far as Competitors are interested, unless regularly submitted and approved at a meeting of the directors in Edinburgh, and duly intimated to Competitors.

His Grace the Duke of Sutherland, President, and the Vice-Presidents of the Society; the Lords-Lieutenant, Vice-Lieutenants, and Conveners of the Counties, with an adequate number of the Members of the Society, to be named at the meetings on the 30th April, by the counties more immediately connected with the Show, together with the Secretaries of the Local Agricultural Associations, have been appointed a Committee for regulating all details connected with the Agricultural Meeting and General Show of Live Stock at Inverness; the Most Noble the Marquis of Huntly, K.T. in his absence, William Mackintosh, Esq. of Geddes, to be Convener of the Committee.

A deputation of the Directors of the Society will be at Inverness two days before the meeting.

FORM OF CERTIFICATE BEFORE REFERRED TO AS APPLICABLE TO  
FAT OXEN.

I        near the post town of       , in the county of       , do certify, That my Ox, (or Oxen as the case may be) of the        breed, to be shewn at the General Show of Live Stock at Inverness, for the Premium in class        was bred by Mr        of       ; he was calved after 1st January 18       , and is now        years and        months old, and was fed by me on       . The quantity of cake or corn he has consumed has been       . He has not at any time been fed on distillery or brewers' wash or grains. He will have to

travel on foot (or by steam or other conveyance as the case may be)      miles,  
 or thereby, from the place of feeding to the Show at Inverness. He was first put  
 up to fatten on or about the      day of      . Witness my hand this  
 day of      1839.

*(Signature of the Exhibitor).*

Any observations as to the animal's appearance, and state of flesh when put up to feed, or other particulars which the Exhibitor may think material, and more especially the pedigree, may be subjoined to the above certificate. The certificates for Breeding Stock, and for Horses, Sheep, and Pigs, will be varied in conformity to the regulations applicable to these descriptions of Stock.

If the lot has not been bred by the Exhibitor, it is particularly desired that the Breeder, if known, may be mentioned.

#### INSTRUCTIONS TO THE JUDGES.

1. Upon their arrival in the Show Yard, the Judges will assemble in the apartment provided for their accommodation, until it is intimated to them that all arrangements, preparatory to their proceeding to view the Stock, are completed.

2. Without inquiry as to the names of parties or places, the Judges are to determine by reference to the *numbers* affixed to each lot by the Secretary. The Judges, in their report, will name not only those animals entitled to the Premiums, but also the others in each class which they may consider most worthy of notice.

3. The Secretary is understood to have satisfied the Committee of the regularity and correctness of the Certificates lodged, before granting the ~~warrant for~~ *Exhibition*; and the Judges, therefore, must proceed ~~upon that~~ evidence, without reference to any other person. They will state, however, for the information of the Committee, if any of the Stock, in their opinion, does not come within the regulations prescribed for the Competition, so that such further inquiry may be made as the Committee may think necessary.

4. In forming their judgment, the Judges will have regard to the symmetry, early maturity, purity, size, and general qualities, characteristic of the different breeds they have to judge of; making due allowance for age, feeding, and circumstances peculiar to the cases which come before them. They shall not award Premiums for Cows, Bulls, or Heifers, which shall appear to have been fattened for the butcher, the object being to have superior animals of these descriptions, for the purpose of breeding.

5. In no case shall a Premium be adjudged unless the Judges shall deem the Lot to have *sufficient merit*; more especially if one Lot only is presented for any of the Premiums.

6. Having formed their opinion, the Judges will sign and deliver their Report; and, ~~having done so~~, they are not afterwards to propose any change. In the event of a difference of opinion, the majority shall be conclusive. When ~~the signed Report~~ is delivered over to the Committee, the duty of the Judges ~~shall cease, and it will devolve on the Committee finally to award the Premiums.~~

CLASS XI.  
GENERAL SHOW OF LIVE STOCK,  
AND  
AGRICULTURAL MEETING AT ABERDEEN IN 1840.

The Society having resolved to hold the General Show of Live Stock and Agricultural Meeting for 1840 at Aberdeen, the following Premiums are offered to be then awarded, aided by liberal donations from the Counties of Aberdeen, Forfar, Kincardine, and Banff, and from the city of Aberdeen.

§ I. CATTLE.  
SHORT-HORNED BREED.

CLASS I.—For the best Bull, calved after 1st January 1835—Twenty-five Sovereigns.

For the second best Bull, of same age—Fifteen Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

It is a condition attached to the above Premiums, that the Exhibitors shall be obliged to let out the Prize Bulls to serve at least forty Cows during the season 1841, within such portion, and at such places of the counties of Aberdeen, Forfar, Kincardine, and Banff, as the Local Committee shall fix. The party claiming the service must guarantee to the owner of the Bulls a payment of Twenty Guineas, or Ten Shillings and Sixpence for each of forty Cows, and that the Bulls shall be returned to the owners in good condition. The owner, if resident in the District, to have a preference of service for his own Stock.

II. For the best Bull, calved after 1st January 1839—Ten Sovereigns.

For second best ditto—Five Sovereigns.

III. For the best Cow of any age—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

IV. For the best Heifer, calved after 1st January 1838—Seven Sovereigns.

V. For the best Heifer, calved after 1st January 1839—Seven Sovereigns.

VI. For the best two Oxen, calved after 1st January 1837—Ten Sovereigns.

ABERDEENSHIRE HORNED BREED.

VII. For the best Bull, calved after 1st January 1834—Fifteen Sovereigns.



For the second best Bull, calved after 1st January 1834—Ten Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

A similar condition as in Class I. The guarantee to be Ten Pounds, or Five Shillings for each of forty Cows.

VIII. For the best Cow of any age—Ten Sovereigns.

IX. For the best Ox, calved after 1st January 1836—Ten Sovereigns.

X. For the best Ox, calved after 1st January 1837—Seven Sovereigns.

ABERDEEN, ANGUS, AND GALLOWAY POLLED BREEDS.

XI. For the best Bull, calved after 1st January 1834—Fifteen Sovereigns.

For the second best ditto—Ten Sovereigns.

For the third best ditto—Seven Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

The same conditions as in Class VII.

XII. For the best Cow of any age—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

XIII. For the best Heifer, calved after 1st January 1838—Seven Sovereigns.

For the second best ditto—Five Sovereigns.

XIV. For the best Heifer, calved after 1st January 1839—Seven Sovereigns.

For the second best ditto—Five Sovereigns.

XV. For the best Ox, calved after 1st January 1836—Ten Sovereigns.

XVI. For the best Ox, calved after 1st January 1837—Seven Sovereigns.

WEST HIGHLAND BREED.

XVII. For the best Bull, calved after 1st January 1834—Fifteen Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

The same conditions as in Class VII.

XVIII. For the best Cow of any age—Ten Sovereigns.

XIX. For the best Heifer, calved after 1st January 1838—Five Sovereigns.

XX. For the best two Oxen, calved after 1st January 1836—Ten Sovereigns.

CROSS BREED.

XXI. For the best two Oxen, first cross between a Short-horned Bull and an Aberdeenshire, Banffshire, Forfarshire, or Kincardineshire Cow, calved after 1st January 1837—Ten Sovereigns.

ANY BREED.

XXII. For the best Ox, of any breed, shewing the most symmetry, fat, and weight, calved after 1st January 1836—Ten Sovereigns.

§ II. HORSES.

CLASS I. For the best Stallion, for the improvement of the breed of Draught Horses, foaled after 1st January 1830—Fifty Sovereigns.

For the second best ditto—Forty-five Sovereigns.

For the third best ditto—Forty Sovereigns.

For the fourth best ditto—Thirty-five Sovereigns.

The Prize Horses to serve in the four counties, in season 1841, according to the arrangement which may be fixed by the Committee. The number of Mares to be served by each horse not to exceed eighty. The party claiming the service must guarantee to the owner of the horse a payment of Eighty Sovereigns, or One Sovereign for each Mare, and that the horse shall be returned to the owner in good condition.

II. For the best Breeding Mare, for Agricultural purposes, foaled after 1st January 1828, and having had at least one Foal—Ten Sovereigns.

For the second best ditto of same age, and having had at least one Foal—Seven Sovereigns.

III. For the best Filly, for Agricultural purposes, foaled after 1st January 1838—Eight Sovereigns.

For the second best, of same age—Five Sovereigns.

§ III. SHEEP.

BLACK-FACED BREED.

CLASS I. For the best two Tups, lambled after 1st January 1837—Five Sovereigns.

For the second best ditto—Three Sovereigns.

II. For the best pen of four Ewes, lambled after 1st January 1835, selected from a regular breeding stock of not fewer than one

hundred, and the pen having reared Lambs for the season—Five Sovereigns.

For the second best ditto—Three Sovereigns.

III. For the best pen of four Wethers, any age—Five Sovereigns

#### LEICESTER BREED.

IV. For the best two tups, lambed after 1st January 1837—Seven Sovereigns.

V. For the best pen of three Ewes, lambed after 1st January 1837, and having reared Lambs for the season—Five Sovereigns.

#### CHEVIOT BREED.

VI. For the best two Tups, lambed after 1st January 1837—Six Sovereigns.

For the second best—Four Sovereigns.

VII. For the best pen of three Ewes, lambed after 1st January 1836—Five Sovereigns.

#### SOUTHDOWN BREED.

VIII. For the best Tup, lambed after 1st January 1837—Five Sovereigns.

IX. For the best pen of three Ewes, lambed after 1st January 1837, and having reared Lambs for the season—Five Sovereigns.

#### CROSSES.

X. For the best pen of four Wethers, of any cross or age, the cross being specified—Four Sovereigns

XI. For the best pen of four Wethers, any age, a cross between a Leicester Tup and Black-faced Ewe—Four Sovereigns.

Tups to serve in season 1841, in the four Counties, under conditions similar to those above-mentioned. Guarantees to be given, as in the Classes for Bulls and Stallions.

#### § IV. SWINE.

CLASS I. For the best boar, farrowed after 1st January 1836—Five Sovereigns.

For the second best ditto of same age—Four Sovereigns.

Conditions as to service same as provided in regard to Tups.

II. For the best Sow farrowed after 1st January 1836—Five Sovereigns.

For the second best ditto of same age—Four Sovereigns.

III. For the best three Pigs farrowed after 1st September 1839—Four Sovereigns.

For the second best ditto of same age—Three Sovereigns.  
The breed of the Swine to be specified.

§ V. EXTRA STOCK, IMPLEMENTS, ROOTS, AND SEEDS.

For Extra Stock of any kind not shewn for any of the above Premiums, and not exceeding in one lot five Cattle, or ten Sheep, and for Implements, Roots, Seeds, &c. Premiums will be awarded and apportioned by the Committee and Judges, in Money, Plate, or Honorary Medals, to the value in whole of not less than Fifty Sovereigns.

§ VI. WOOL

1. For the best sample of Combing Wool of seven fleeces—Five Sovereigns.

2. For the best ditto of Wool of Sheep of the black-faced breed, of seven fleeces—Five Sovereigns.

Competitors for these Premiums are required to state the number of Sheep of which the flock consisted, from which the sample is taken, the gross quantity clipped, whether the fleeces are ewe or hog, and, if sold, the price obtained; and in regard to the combing wool, whether it is of the New Leicester, Cotswold, or any cross of these breeds. The Exhibitors must have bred the stock from which the wool has been obtained.

§ VII. PRODUCTS OF LIVE STOCK.

I. CURING BUTTER.

CLASS I. To the owner of any Dairy in the Counties of Aberdeen, Forfar, Kincardine, and Banff, who shall have made and cured and shall exhibit at the Show, the best quality of Butter for the market; the quantity made and cured not being less than two cwt. during the season 1840—Five Sovereigns.

For the second best quality—Three Sovereigns.

A declaration must be lodged with the Secretary, by the party competing, that the sample produced is a fair average of the quality made and cured by the Competitors, during the season 1840.

2 MAKING CHEESE.

II. To the person in the said four Counties who shall produce the best specimen of Sweet or Full Milk Cheese, made of any variety that he find most profitable for the market, the quantity not being less than one cwt. of 112 lb., 16 oz. to the lb.—Five Sovereigns.

For the second best quality—Three Sovereigns.

The whole quantity of the variety of Cheese produced, made by each Competitor during the season, must not be less than one cwt., and a declaration must be lodged that two or more Cheeses produced are a fair average of the kind competing made in that year by the Competitor.

III. To the Owner of any Dairy in the said four counties who shall have made for sale the best quality of Cheese from skimmed milk, not being less than one cwt. during the season 1840—Five Sovereigns.

For the second best quality of ditto—Three Sovereigns.

These Premiums are offered under the same conditions as the Premiums in Class II.

In the event of two or more lots of Butter or Cheese being deemed of equal merit, the Premiums will be awarded to the greater quantity.

#### GENERAL REGULATIONS FOR THE SHOW AT ABERDEEN.

1. The Competition will take place at Aberdeen in the end of September, or beginning of October, 1840. The particular day will be afterwards intimated. The Competition will be open to Stock from any part of the United Kingdom.

2. The name, residence, and post-town of the Exhibitor, the name of the Breed, the number of the Class in which the animals are to be exhibited, their age, and, in the case of Fat Stock, the kind of food on which they have been fed, must be regularly certified. Forms of the necessary Certificates, and information as to the period when they fall to be lodged, will in due time be furnished.

3. It is required that the Stock shall have been *bona fide* the property, and in the possession of the Exhibitor, from 1st May of the year in which the Show is to be held. Evidence must be produced, if desired, that the Stallions and Bulls, for which Premiums are awarded, have had produce during the preceding year, provided they are four years old and upwards.

4. No Cattle fed on distillery or brewers' wash or grains (which are accessible to a few competitors only) will be allowed to compete. Cows exhibited for Premiums must have had a Calf, or be in Calf, during the year of the Show. Feeding on Oil Cake or Grain is not excluded, but, if used, the quantity to be specified.

5. The distance each animal travels to the Show, and, in the case of Fat Stock, the date of being put to fatten, to be mentioned.

6. A Competitor may show more than one Lot in any Class. It shall not be competent to enter a Lot in one Class and afterwards to withdraw it for competition in another Class, unless by the directions of the Committee. An animal having already gained the first premium in its Class, at any of the Society's General Shows of Stock, is not to be shewn again in competition in the same Class, but may be exhibited as Extra Stock.

7. Stock which cannot be shewn in any competing Class, may be exhibited as Extra Stock. If any Lot of Fat Stock, for which a competing Class is open, is to be entered as Extra Stock, from an impression on the part of the Exhibitor

that they are too young to compete in the Classes open to them, the Judges of Extra Stock will be directed to notice them specially, provided they possess merit.

8. The Judges will be instructed not to award premiums to Cows, Bulls, or other breeding Stock, which shall appear to have been fattened for the butcher; the object being to encourage such Stock for the purpose of breeding. They will also be instructed to discourage overfed animals.

9. The Bulls, Stallions, Boars, or Rams, for which premiums are awarded, must serve in the Districts more immediately connected with the Show, during the season 1841, the rates (so far as not already indicated) and places, to be fixed by the Committee in charge of the Show. All the Prize Animals in these Classes shall, under penalty of the owners forfeiting the Premiums, be brought to the Show Ground on the day following the Show, when after an examination by practical Judges to be appointed by the Local Committee, it will be determined what animals shall be claimed to serve. It is recommended to Exhibitors in the Classes now mentioned, whose animals may be noticed by the Judges in terms of commendation, to bring them forward on the day after the Show, which will enable Breeders, who may not be resident in the Districts to which the Prize Animals are assigned, to obtain the service of superior animals. Previous to the day of Show, the Local Committee will define the districts in which the four Prize Stallions are respectively to serve. The Premiums to animals claimed for service will not be paid until 1st September 1841.

10. The other Regulations referable to General Shows will be published in due time for the information of Competitors. In the mean time, intending Competitors are referred to those published for the Inverness Meeting for 1839.

## THE VETERINARY SCHOOL.

This Establishment is conducted under the superintendence of Mr Dick, Veterinary Surgeon, the Lecturer appointed by the Society. —Students receive instruction in the anatomy and diseases of the horse, and other domestic animals, in the best system of treatment and cure, in stable management, and in the most approved and scientific modes of shoeing. The students are sent to the class by Local Agricultural Associations, or attend on their own account. The hour of Lecture is accommodated to the convenience of students attending the Agricultural and other classes in the University. Those students who attend two courses, and are afterwards found qualified at the annual Examination by the Committee of Medical Examinators, receive Certificates. Graduates of the School under the Society's patronage are now eligible for Veterinary Surgeons in the Army and East India Company's service.

Mr Dick occasionally delivers a popular course of Lectures to a class of gentlemen. It may be also observed, that several of the principal Lecturers in different branches of Medical Science, have

for some years given free admission to their classes, to those Veterinary Students who intend to practise.

The Lectures and Demonstrations for the Session 1839-40, will be commenced in November next, at the Lecture-room in Clyde Street, Edinburgh.

By Order of the Directors,

CHARLES GORDON, *Secretary.*







# PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL  
SOCIETY OF SCOTLAND,

FOR PROMOTING

AGRICULTURE AND INTERNAL IMPROVEMENT  
IN SCOTLAND,

IN

*1840.*

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## PRELIMINARY NOTICE.

The business of THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND is conducted by a President, Four Vice-Presidents, Thirty Ordinary, and Ten Extraordinary Directors, a Treasurer, an Honorary Secretary, and a Secretary, to which last all communications are addressed. The Ordinary Directors are subdivided into Committees for the dispatch of business, assisted occasionally by those Ordinary Members most conversant with the subjects to be discussed. The Report of each Committee is brought before the Directors collectively for farther procedure, and their proceedings are again submitted for approbation to a half-yearly General Meeting of the Society. One of the General Meetings is, by the Charter, appointed to be holden on the second Tuesday of January; the other on such lawful day in the months of June or July as the Directors may fix. New Members are admitted at either of these General Meetings by ballot. They pay a small annual contribution of £1 : 3 : 6, or, in their option, and in full of all future claims, a life subscription of Twelve Guineas. The Annual Subscription is payable in advance, and is expected to be so paid or remitted, by the Members who are liable in it, without expense to the Society. All Meetings of Directors, or Committees, are open; and at these any member may attend and deliver his opinion on the subjects under consideration, though, in cases of division, the Directors or Members of the Committees only are entitled to vote. Members have access to the Society's Library, which is annually increasing by the purchase or donation of books connected with the purposes of the Institution.

When the Highland and Agricultural Society of Scotland was instituted in the year 1784, the object chiefly contemplated was the improvement of the Highlands, and hence the name—THE HIGHLAND SOCIETY OF SCOTLAND—which it then assumed. But the great increase in the number of its Members since that time, the happy management of its funds, and the change in the general state of the country, have long enabled it to extend the design of its first institution, and direct attention to every part of North Britain where industry might be excited or the useful arts improved. In accordance with this extension of the purposes of its institution, the Society, in its Supplementary Charter, has been named THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The Society has, neither by its Charters of Incorporation, nor by its practice, been limited in its patronage to any one department of industry; but it has regarded, as the fitting objects of encouragement, every application of useful labour which might tend to the general good. But although its patronage be thus extended as regards its objects, circumstances have arisen to modify, in some cases, the application of it. The establishment of certain Boards, for the encouragement of the Herring Fishery, and the like, has induced the Society to restrict its original views, and to devote its attention, and apply its funds, in a more special manner, to other objects, and chiefly to Agricultural and Rural Economy in their various branches.

In fulfilment of its purposes, the Society is every year accustomed to offer and award a variety of Premiums, as the means of eliciting and diffusing knowledge as incitements to industry, or as the rewards for useful undertakings. Those

relate to every subject which may be supposed to fall within the plan of the Institution : such are, the Improvement of Waste Lands by Tillage, by Irrigation, or by Draining, the development of the Mineral products of the country, the extension of Plantations, as the objects of ultimate profit, or of present embellishment and shelter,—the improvement of the breeds of Live Stock, and of the qualities of Wool,—the encouragement of certain domestic Manufactures, and not the least in interest and importance, the awakening the industry of the Lower Ranks to such pursuits as shall promote their content, by ameliorating their condition. A Mechanical Department exists for rewarding the original invention or subsequent improvement of all machines and implements for Agricultural purposes, the construction of those for other branches of Rural Economy, and of some for domestic convenience. Models of these are received and preserved in the Society's Museum ; and descriptions of all such as merit attention are as speedily as possible conveyed to the public.

Although certain subjects be thus selected as the objects of experiment or discussion, the patronage of the Society is not restricted to these objects. Its purposes being the promotion of general industry and improvement, it receives with favour every beneficial communication, and every statement of facts which may admit of an useful application.

The Papers of the Society are printed periodically in "THE QUARTERLY JOURNAL OF AGRICULTURE, AND THE PRIZE ESSAYS AND TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND," published by Messrs BLACKWOOD of Edinburgh, Mr CADELL of London, and Mr CUMMING of Dublin.

The Society is prepared to receive with attention all written communications, in the form of Essays, Reports, Notices of Experiments, and the like, which may be presented to it by LOCAL ASSOCIATIONS. Such communications, if approved of by the Society, will be inserted in the Transactions ; and opportunity will be given to the Authors or Associations of obtaining separate copies from the types for circulation in the district.

All communications relating to Premiums, as well as Papers or Reports for publication in the Transactions of the Society, and other subjects for the consideration of the Directors, are to be addressed to Sir CHARLES GORDON, the Secretary of the Society, at the Society's Hall, Albion Place, Edinburgh.

## NOTICE TO CANDIDATES,

### AND GENERAL RULES FOR COMPETITION.

When subjects are specially selected for competition, it is always to be understood, 1st, That however concisely the subjects themselves be announced, ample information is required concerning them—2d, That this information shall be founded on experience or observation, and not on simple references and quotations from books—3d, That it shall be digested as methodically as possible—and 4th, That Drawings, Specimens, or Models, adapted to a defined scale (3 inches to the foot if convenient), shall accompany writings requiring them for illustration.

Certain conditions are annexed to each of the various subjects of competition, as detailed in the List of Premiums ; and these are rigidly enforced by the Society,

as the only means of insuring regularity in the conduct of the business, and of distributing exact justice among the competitors.

In all Essays for Competition, for Premiums offered, it is expected that when facts not generally known are stated, they will be authenticated by proper references. Competitors in Essays are not to communicate their names, but shall transmit along with the Essays a sealed note containing their names and addresses, and inscribed on the back with some distinguishing motto or device, which shall also be inscribed on the Essay. When this regulation is neglected, such Essay shall not be received in competition. If the Essayist has formerly gained a Premium from the Society for a paper communicated by him, it is recommended that his subsequent Essay shall be written in a different hand from that of the former successful paper. Surveys, Essays, or Reports, of considerable length, must be bound, or inserted in a book, to facilitate their perusal.

None of the sealed notes, except those that bear the distinguishing motto or device of the Essays found entitled to Premiums, will be opened, and the sealed note will not in any instance be opened without the consent of the author, unless a sum equal to at least one-half of the Premium offered shall have been adjudged. But should no application be made for the papers on or before the 1st of March in each year, it will be held as belonging to the Society on the terms proposed. Such Essays as are not found entitled to any Premium will, with the sealed notes, be returned to the authors if required. The Society is to be at liberty to publish the Essays, or extracts from them, for which the Premium, or part of it, shall be awarded.

Candidates are requested to observe, that, in any instance, when Essays, Reports, or Certificates are unsatisfactory, the Society is not bound to give the reward offered; and that in certain cases, power is reserved of giving such part only of a Premium as the claim may be adjudged to deserve; but competitors may feel assured that the Directors will always be inclined to judge liberally of their several claims.

Essays, Reports, or Communications on subjects for which Premiums have in former years been offered, but not fully competed for, will still be received, although the subjects may now be discontinued on the List, and Honorary awards will be voted when the communications appear to merit them.

Essays and Reports, for which no Premiums have been awarded, must, if desired to be returned, be called for within one year from the date of Competition, otherwise the Society will not be responsible for the papers.

Competitors will understand it as a condition having reference to every Premium and reward offered by the Society, that the decisions of its committees and Board of Directors, as confirmed by the Society, are to be final and conclusive, and that it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

In reports of Experiments relating to the Improvement or Management of Land, it is expected that the expenses shall be accurately detailed.

In all Premiums offered, having reference to Weight or Measure, the New or Imperial Standards are alone to be understood as referred to; and Competitors are required to state their calculations according to these, the only legal standards, otherwise the claim will not be entertained.

When the Premiums are awarded in Medals or Plate, the Society will, in such cases as the Directors may see proper, allow them to be paid in money, on the application of the successful Candidates.

The Premiums awarded by the Society are payable after the 10th February, for the preceding year.

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# PREMIUMS, &c.

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SOCIETY'S HALL, ALBYN PLACE,  
EDINBURGH, 10th Feb. 1840.

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND does hereby advertise, That the under-mentioned PREMIUMS are to be given by the Society in the Year 1840, &c.

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## CLASS I.

### AGRICULTURAL MACHINERY.

#### 1. APPLICATION OF STEAM TO THE CULTIVATION OF THE SOIL.

A Premium of Five Hundred Sovereigns will be awarded for the first successful Application of Steam Power to the Cultivation of the Soil

By the cultivation of the soil are to be understood the operations of ploughing and harrowing, or preparing the soil in an equally efficient manner, and the other purposes for which animal power is now used ; and the success of the invention will be judged of in relation to its applicability to the above purposes in the ordinary situations of farms in this country, and to the saving *in time, labour, and outlay*, which it may possess over animal power, as now generally employed in the cultivation of the soil.

The merits of the invention, with reference to the conditions enumerated, will be judged of by a Committee of the Society, specially appointed, and the inventor will be required to exhibit the machinery, and modes of applying it in Scotland. The Secretary, on application of intending competitors, will furnish any information which may be required.

The Society, in offering this Premium, does not feel it to be necessary to express opinions as to the probability of a successful application of steam to tillage, as to the means by which the object may be attained, or as to the effects which might be supposed to result from the application of such a power. But it has felt it

to be a duty imposed upon it by its situation, to bring the subject in a proper manner before the country, to encourage those who are now engaged in this class of experiments, and to stimulate future invention, by the offer of a Premium corresponding, in some measure, to the interest and importance of the subject. Looking to the greatly extended application which has recently been made of steam as a motive power, and seeing that the difficulties which are opposed to its application to the purposes of the farm have been at least partially overcome by the efforts of individuals, it has appeared to the Society, that, without exciting expectations which may not be realized, a strong ground exists for having this possible application of steam-power made the subject of fair and satisfactory experiment.

## 2. IMPLEMENT FOR CUTTING DRAINS.

The Gold Medal, or a Piece of Plate of that value, will be given for an implement or implements, worked by horses, which shall produce the greatest saving compared with the expense at present incurred by manual labour, in Cutting Drains, in land where the subsoil is of a retentive nature.

The invention must be original, and specific information given as to the time when the implement was first used.

Models and Descriptions, with certificates of the efficiency of the implement, to be lodged, as after specified, with reference to implements submitted for the Premium No. 3.

## 3. INVENTION OR IMPROVEMENT OF IMPLEMENTS OF HUSBANDRY.

To the person who shall invent or improve any Instrument or Machine applicable to Husbandry or Rural Economy (other than those above specified), and which, from its utility in saving labour or expense, simplicity, or cheapness of construction, or other circumstances, shall be deemed by the Society deserving of public notice—The Gold or Silver Medal, or such sum in Money as the communication shall appear to deserve.

The account of the implement must be accompanied by a model made, when convenient, to a scale of three inches to the foot, to be deposited in the Society's Museum. The model to be formed of wood or metal, and the notice or description transmitted with it must specify, according to the best of the inventor's abilities, the purpose or advantage of his invention or improvement. When machines or models are transmitted, it must be stated whether they have been elsewhere exhibited or described. Models and Descriptions may be lodged at any time with the Secretary.

## CLASS II.

### ESSAYS AND REPORTS ON VARIOUS SUBJECTS.

#### 1. GEOLOGICAL SURVEYS.

Fifty Sovereigns, or a Piece of Plate of that value, will be given to any person who shall, from his own observation, execute the best Geological Survey of any County or District in Scotland, except the following, viz. Berwickshire, the Lower District of Morayshire, Renfrewshire, the North of Ayrshire, the Middle or Lower part of Perthshire, Sutherlandshire, Fifeshire, Banffshire, and Lanarkshire, which are already reported on.

The author must, to compete for this Premium, himself draw up a written Report or Essay on the Rocks and Soils of the District, and colour Geologically, in the fullest detail that the scale will admit of, a portion of Thomson's Atlas of Scotland (folio edition), corresponding to an extent of surface of not less than 200 square miles, and at the same time send a collection of specimens of rocks to illustrate both the Essay and the Map—all which must be lodged with the Secretary on or before the 20th of October in any year.

This Report must give a full description of the Geology and Mineralogy of the District represented, accompanied by coloured sections of such portions of it as may appear to require this species of illustration, founded on actual observation: if in any case the sections should be ideal, it must be so stated. In this Report, the author will be required to explain the classification and subdivision of the different rock-formations he may have adopted, and, in general, to communicate every thing of interest or importance that may occur connected with the subject of the survey.

The author will be expected to have paid particular attention to the Topography of the District included in the survey, so as to be able to point out any errors or omissions he may have detected in the Map; or should he be able to procure a better survey of the district he is describing than that in Thomson's series of Maps, he will be permitted to avail himself of it, provided it be on a scale equally suited to the purpose.

The author is farther invited to direct his attention to the Soils of the District, so as to describe the ingredients of which they are composed, and whether they have been formed by the disintegration of the subjacent rocks, or have been transported from distant parts. Where the soil has been brought from a distance, the authors will state the quarters from which it appears to have

been brought, as well as the boulders that occur in the soil, or are strewed over the district. It is necessary also, that the author should shew the connection between the agriculture of the district and its rocks and soils, in reference to their influence on the pastures, crops, and timber of the district. Where Peat-Mosses occur in the district, the author will be expected not only to describe their extent, depth, quality, and general character, subsoil on which they rest, and susceptibility of improvement, but also any remarkable particulars regarding their component parts, such as the kind of wood, nuts, plants, or leaves, which prevail, or their accidental extraneous contents, such as horns, or any remains of works of art. Authors, in describing the country, must also notice any remarkable or interesting spring waters, particularly in respect to their temperature, and to the medicinal or other properties they may appear to possess. If not already sufficiently known, a chemical analysis of such waters as may be considered likely to be of importance must accompany the Report. It is particularly requested that the rock specimens constituting the collection may be carefully selected, fresh, and characteristic; and it is very desirable that they should be as uniform as possible in size and form. The following dimensions are recommended, viz. length, four and a half inches; breadth, three and a half inches; thickness, from one to two inches. There must of course be many exceptions to this rule, as, for example, in the case of very coarse conglomerates, large grained granites, basaltic columns, junctions of rocks, organic remains, &c. The Report, Maps, Sections, and Specimens of the different Rocks referred to in the Report, are, in the event of the author being found entitled to a Premium, to be the property of the Society.

Further, for Geological Surveys deemed worthy of distinction, but which may not be found entitled to the principal Premium in the year in which they are lodged, the Society's Gold or Silver Medal will be awarded to the authors. And, in order to hold out every encouragement to geologists to assist the Society in the important object of completing Geological Surveys of the various Districts of Scotland, it has been resolved, that, should any Survey not obtain a Premium in the year in which it is transmitted, the author shall be entitled to amend it by farther observation, and to bring it forward for competition in a future year.

The Surveys in competition for this Premium in 1840, to be lodged on or before the 20th of October next, under the conditions on pages 5 and 6.

**NOTE.**—Two Hundred Square Miles being the smallest extent for which the above Premiums are, under any circumstances, to be awarded, will only be considered sufficient in cases in which the Competitors shall have selected for the subjects of their Surveys and Reports, those Districts which, from the variety or the complexity of the geological formations, and the importance of the mineral resources they contain, possess the greatest degree of public interest, and, at the same time, require the most time, labour, and talent, to describe with the minuteness and accuracy expected.

It must, therefore, be distinctly understood, that the Maps and Descriptions of less interesting parts of the country in which a more uniform geological structure, and a greater sameness of mineral character, are found to prevail, will not be entitled to the Premium, unless they shall comprehend such an increase in the number of square miles beyond the minimum extent above specified, as the Directors may judge to be fairly proportioned to the circumstances of the case in these respects, and to the comparative facility with which the work may consequently appear to have been performed.

## 2. REPORTS ON COAL DISTRICTS.

Thirty Sovereigns, or a Piece of Plate of that value, will be given for the best Geological and Mineralogical Report upon any Coal District in Scotland, with the exception of those situated in the South-east part of the County of Fife, the North of Lanarkshire, at Muirkirk in Ayrshire, in the Parish of Dunfermline, Fifeshire, in the Parish of Carlisle, Lanarkshire, and at Quarter in Lanarkshire, which have already been reported on.

In these Reports, it is expected, that, besides a general description of the district, the principal shaft sections, showing the order of superposition and succession, as well as the thickness of the different strata, together with their lines of bearing, the direction and degree of their dip, and their organic contents, shall be carefully noticed and accurately detailed. The occurrence of slips, faults, or other disturbances, their direction, and the effects occasioned by them on the adjacent strata, must also be particularly noticed, with an explanation of their probable origin. The author must also particularly describe the trap-rocks, if any exist, in the Coal-Field, and specify their nature, situation, and extent. He will also state whether they intersect the other strata in the form of dykes, or in what other way they occur; and in each case he will describe what effect has been produced by them on the contiguous sedimentary strata. Limestone, iron, or any other profitable mineral or metallic substances in the district, must likewise be specially noticed.

Each Report must be accompanied by a general map or plan of the district, and coloured sections taken through such parts of it as

may best serve to illustrate the above details, and also by specimens of the different kinds of coal, the various stratified and unstratified rocks, and the organic remains occurring in the coal-field; all of which are, in the event of the author being found entitled to a Premium, to be the property of the Society.

The varieties of Coal occurring in the district must be mentioned, as well as the price of each variety at the pit-mouth. The use to which each variety of coal is generally applied must also be noticed.

It will enhance the value of the Essays, in the opinion of the Society, if they contain a statement as to the probable quantity of coal remaining in the district unworked, together with the data on which that statement rests. It would be desirable also, if information could be given generally as to the number of Pits where coal is worked in the district, and as to the quantity of coal (stated in tons) which, during each of the preceding three years, has been raised in it, the number of steam-engines, of colliers, and horses, employed to raise the same. Authors are invited also to direct their attention to the moral and social condition of the persons employed in the collieries.

Reports for the present year's competition to be lodged on or before the 20th of October next, under the conditions which will be found on pages 5 and 6.

No Report will be entitled to this Premium unless the whole of the above conditions shall have been strictly fulfilled; and its merits will be estimated with reference to the amount and value of information given, rather than to the extent of country described.

The Society's Gold or Silver Medal will be given for such Reports on Coal Districts as may be found worthy of that distinction, but which may not be considered entitled to the principal premium, provided they are lodged with the Secretary by the time specified.

**NOTE.**—The Society takes this opportunity of pointing out to the Proprietors and Managers, and other individuals employed in Coal-Works, how much they have it in their power to contribute to the advancement of science, by noticing and preserving the organic remains that have been, or may be, found in the Coal-Fields with which they are respectively concerned. Fossil remains are most commonly met with in limestone, slate-clay, bituminous shale or blaes, and in the nodules and bands of ironstone; and it is earnestly recommended, that the miners should be directed to lay aside, and to preserve as entire as possible, every extraneous substance of unusual form and appearance, which they may find in any of the beds in which they are working.

The Society will at all times be glad to receive communications on this subject, accompanied by specimens, and will confer Honorary Premiums upon those individuals who may most distinguish themselves by their intelligence, zeal, and diligence, in bringing important and interesting discoveries of this nature to its notice.

### 3. MINES AND MINERALS.

The Gold Medal, or a Piece of Plate of such value as the communication may be adjudged to deserve, will be given for the most satisfactory Report, describing all the useful Metals or Minerals which might be profitably worked, and which are not now worked, in any particular District in Scotland, with the exception of Lismore, Appin, and Ardehatten, already reported. The district reported on must not be less than fifty square miles. The Reports must be accompanied with specimens of the Metals or Minerals described; and these must, for the present year's competition, be lodged on or before the 20th October next, under the conditions on pages 5 and 6, and remain the property of the Society, in the event of a premium being awarded to the Reporter.

### 4. PRODUCTS OF PEAT-MOSS, LARCH PRUNINGS, &c

The Gold Medal will be given for the best and approved Account of the Uses to which Peat-Moss, Larch Prunings, &c. may be beneficially applied, and especially as to the extracting of Tar from these substances, and its application to the Smearing of Sheep, and other purposes to which foreign wood tar is now applied.

It is expected that the Competitors shall detail the experiments on which their Reports are founded, and shall add such observations as may occur on the production of Pyroligneous Acid from the same materials. Reports to be lodged on or before the 20th October 1840, under the conditions which will be found on pages 5 and 6.

### 5. PRODUCTION OF SCOTTISH SULPHUR.

I. The Gold or the Silver Medal will be awarded, according to circumstances, for the most satisfactory descriptive account of beds, masses, or veins of common Iron-Pyrites, or Sulphuret of Iron, or other compound of Sulphur, existing in Scotland.

The communication must particularly specify the local situation of the different beds, masses, or veins, their extent or dimensions, as far as can be ascertained, the quantity of pyrites found in ave-



rage specimens of the compound, and the kinds of rocks in which it occurs. The practicability of working the beds or veins, and the means of transport, should be adverted to.

Specimens exhibiting the average richness of the compound must accompany the account, care being taken to place numbers or tallies on the specimens, corresponding with numbers mentioned in the descriptive accounts.

II. The Gold Medal will be given for the best account of an economical mode of Extracting the Sulphur from common Iron-Pyrites, or such Sulphur-compound as may be found in Scotland, by roasting and sublimation, or otherwise.

Reports for both Premiums to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

#### 6. EXTENDING APPLICATION OF WATER AND OTHER POWER TO FARM PURPOSES.

Twenty Sovereigns, or Plate of that value, will be given for the best and approved Essay on the Extending of the Application of Water and other Power to Farm purposes.

The writer must enumerate the various subordinate purposes to which the power impelling thrashing-machines may be applied, such as cutting turnips, chopping hay, &c., and describe the safest, simplest, and most economical way of connecting the first power with these subordinate machines. He must also point out how premises at present generally in use for thrashing-machines may be most conveniently adapted to these other purposes, and what better arrangement could, with the same view, be made in the erection of new premises.

The writer is requested to state his opinion as to the best construction of the first power; that is to say, if steam be used, whether beam, crank, or any other kind of engine, and whether on the condensing or non-condensing principle; if water be used, whether overshot, undershot, or breast-wheel, and so on with respect to other powers. The writer must accompany his Essay with explanatory Drawings and Estimates, to shew that his plans will not be attended with any undue outlay or expense.

Reports to be lodged by 20th October 1840, under the conditions on pages 5 and 6.

#### 7. IMPROVED SHEEP SALVE.

A Premium of Twenty Sovereigns, or Plate of that value, will be given to the person who, on or before the 20th October 1840,

shall lodge with the Society a specimen of a salve which can be economically employed for Smearing Sheep, with a view to secure the health and comfort of the animal, without deteriorating the value of the fleece or carcass, and which shall have been proved by at least two successive years' use on the same stock, not under 20 scores—one-fourth of the animals upon which the experiment is repeated, being the same as those upon which it was formerly tried.

The Society understands that of late years a variety of new substances have been tried, which have either entirely or partially failed, and the wool-growers, especially in the Highland Districts, have been obliged to resort to the former plan of using tar and grease, believing from experience that no other known substance sufficiently protects the animal from cold and wet.

The great objection to tar is, that the value of the wool smeared with it is very much lowered, from the manufacturer being unable to render it sufficiently white to dye it any bright colour.

The Society is therefore anxious to procure a salve which will obviate this disadvantage, at the same time that the health and condition of the stock on which it is used may be completely preserved.

The Essays, with specimens and a description of the Salve,—a specimen of the Wool,—and a note of the price obtained for it, to be lodged by 20th October 1840, under the conditions on pages 5 and 6.

#### 8. INSECTS INJURIOUS TO WHEAT.

The Gold Medal, or Plate of that value, will be given for the best and approved account of Insects injurious to Wheat.

Reports to be lodged on or before the 20th October 1840, under the conditions similar to those specified for No. 10.

#### 9. INSECTS INJURIOUS TO TURNIPS.

The Gold Medal, or Plate of that value, will be given for the best and approved account of Insects injurious to Turnips.

Reports to be lodged on or before the 20th of October 1840, under the conditions similar to those specified for No. 10.

#### 10. INSECTS INJURIOUS TO FOREST-TREES.

The Gold Medal, or Plate of that value, will be given for the best and approved account of Insects injurious to Forest-Trees, especially the Larch and the various species of Pine.

Reports to be lodged on or before the 20th October 1840, under the conditions which will be found on pages 5 and 6.

It is required that the Essays for the Premiums Nos. 8, 9, and 10, be the result of personal observation; specimens of each Insect, in its various stages, to be transmitted along with the Report—the nature and extent of the damage caused by the Insects to be explained—and the most effectual remedies which have been employed for preventing or checking their ravages, to be described; and further, a distinct account to be given of the nature and condition, exposure, and altitude above the sea, of the ground on which the plants or trees reported on were grown.

NOTE.—Accounts, by scientific entomologists, of noxious insects infesting the timber, bark, or foliage of trees, with suggestions for obviating their ravages, will be very acceptable to the Society, and Honorary Premiums will be awarded to the authors of such communications, according to circumstances.

#### 11. COMPARATIVE NUTRITIVE PROPERTIES OF GRASSES.

Twenty Sovereigns, or Plate of that value, will be given to the Proprietor or Tenant in Scotland who shall, on or before the 20th October 1840, transmit to the Society a satisfactory Report of Experiments made to ascertain the comparative nutritious qualities of the ordinary Grasses at different ages, on the same quality of soil, and managed in the same manner.

The experiments to be made by the feeding of Milch Cows on pastures of different ages sown down in the same manner, and the same Cows may be pastured on the different fields of grass by alternate weeks or other equal periods, and the comparative produce ascertained by the quantity and quality of the milk produced. It is required that the quality of the soil shall be described, and the ages and kinds of Grasses of which the pastures consist, and that the breed of cattle and other particulars necessary to bring out a satisfactory result shall be given. Competitors are referred to the conditions, which will be found on pages 5 and 6.

#### 12. EXTIRPATING FERNS FROM PASTURE.

Fifteen Sovereigns, or a Piece of Plate of that value, will be given for the best and approved account, founded on experience, of a cheap mode of eradicating Ferns from Pastures, and particularly from Hill Pastures, where the plough cannot be employed.

The extent of ground subjected to the experiment must not be less

than twenty acres; the Report must state what proportion of the surface was occupied by the Ferns, with the expense per acre incurred in their eradication, and must be lodged with the Secretary, accompanied by specimens of the Ferns destroyed, on or before the 20th October 1840, under the conditions on pages 5 and 6.

There is evidence in favour of the belief that the object in view may be accomplished by repeated irrigation of the ground; also, that repeated cuttings of the Ferns while young and succulent, thus preventing their bringing their tops to perfection during the whole season, or two consecutive years, will destroy them. It is desirable that the truth of these opinions should be established or refuted, and any other successful mode of treatment pointed out.

### 13. THOROUGH DRAINING. *

The Society being desirous of obtaining information on the advantages arising from the system of thorough draining, offers

Twenty Sovereigns, or a Piece of Plate of that value, for the best and most satisfactory account of an experiment, made on not less than four acres of land, one-half of which shall have been Thorough Drained, and the other half Undrained. The crop to be of the same description on both portions of the field, and the cultivation in other respects as nearly as possible under the same circumstances. The quantity and quality of the produce of each portion to be stated. The dimensions of the Drains, their distance, and the materials with which they were filled, to be noticed, and the expense of the improvement given, with such other observations as the experimenter may deem deserving of attention. Reports of experiments made in two or more years will give greater satisfaction than those which have been made in one year only. Reports to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

### 14. SUBSOIL-PLOUGHING OF THOROUGH-DRAINED LAND.

With the view of obtaining farther information as to the advantage of the Subsoil-Ploughing of Thorough-drained Land,

Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best and most satisfactory account of an experiment made on not less than four acres of land, of as nearly as possible the same quality and description, one-half of which shall have been Subsoil-Ploughed, and the other cultivated in the ordinary way;

the whole to be under the same description of crop, and in other respects both portions to be cultivated and managed alike. The quantity and quality of the produce of each portion to be stated ; the depth reached by the subsoil-plough to be noticed ; with such other observations as the experimenter may deem deserving of attention. Reports to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

#### 15. MOLE PLOUGH.

The Society, understanding that a considerable extent of ground has been successfully drained in England, at an expense not exceeding twenty shillings per imperial acre, by means of "the Mole Plough," offers a Premium of

Ten Sovereigns for the best and approved account of an experiment made in Scotland, in the years 1839 and 1840, on not less than five imperial acres of pasture or arable land, one-half of which shall have been drained in alternate portions of four or six ridges, and the other half left undrained.

Reports to be lodged with the Secretary on or before the 20th October 1840, under the conditions on pages 5 and 6.

#### 16. EXPERIMENTS WITH MANURES.

The Society being desirous to ascertain, by experiment, the value of certain substances recently introduced as Manures, offers a Premium of

Twenty Sovereigns for the best and approved account of an experiment or experiments, shewing the fertilizing powers of at least four of the following substances, as compared with manures in common use :—1. Jauffret's Engrais ; 2. Kimberley's Trotsworth Liquid Manure ; 3. Rosser's Vegetable Decomposition ; 4. Owon's Animalized Carbon ; 5. Clarke's Desiccated Compost ; 6. French Poudrette ; 7. The Chemical Seed Manure, advertised to be prepared by Hodgson and Simson, at Walton, near Wakefield ; 8. The Humus and Carbon, or the Paris and Flemish Fertilizing and Disinfected Composts, prepared by Lance and Co. ; 9. Poitevin's Patent Disinfected Manure.

The extent of ground experimented on not to be less than a quarter of an acre for each description of manure. The quantity and cost of the different descriptions of manure employed, and the value of the crop produced by each, to be accurately ascertained and reported on, with such other particulars and observations as the Reporter may deem deserving of attention.

Competitors must, along with their Reports, transmit at least half a pound weight of the soil collected prior to the commencement of the experiment, and about the same quantity of each kind of manure employed. Reports to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

#### 17. ANALYSIS OF BONE OR RAPE DUST.

Extensive experience having proved, that a ton of Bone or Rape Dust is equal, in the production of Turnips, to fifteen or twenty tons of well prepared farm-yard manure, the Society, considering it of importance to Agriculture to ascertain the element or elements contained in the two former, on which this superiority depends, offers

The Gold Medal, or Plate of the same value, for the best and approved Essay, founded on chemical analysis, shewing the element or elements in Bone and Rape Dust, which render them so much more efficient than farm-yard manure in producing Turnips.

The Essays will be expected to exhibit a chemical analysis of the three descriptions of manure mentioned, and of any other deemed by the competitors essential to the object of the Society in offering this Premium.

Essays to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

#### 18. ON THE EFFECTS OF ALTITUDE ON VEGETATION.

For the best and approved Essay on the Effects of Altitude on Vegetation, in the same latitude,

The Honorary Gold or Silver Medal, according to the merits of the communication.

Regard to be had to the corresponding difference of altitude and latitude in respect to the production and perfection of culmiferous and leguminous crops, and the hay and pasture grasses, and also in respect to the growth of forest trees for timber. The nature of the soil and subsoil, and prevailing rocks, to be particularly attended to, and the distance from the sea to be specified. Essays to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

#### 19. FEEDING OF CATTLE.

Twenty Sovereigns, or a Picco of Plate of that value, will be given for the best account of an experiment of the employment of substances other than the common produce of the Farm in the Feeding of Live-stock.

The substances on which experiments may be made are, Oil Cake, Rape Cake, Malt Dust, Brewers' and Distillers' Refuse, Sugar, Molasses, Sago, or any other nutritive food. The animals put up to feed not to be fewer than three Oxen for each kind of food on which the experiment is to be made. The live weight of the Oxen at the time of being put up to feed, must be determined and compared with that of an equal number of Oxen put up to feed on the common provender of the farm, as straw and turnips, hay and turnips, and the like; or, if the time of feeding shall be summer, grass used as herbage, or cut for soiling. The live, or, if possible, the dead weight, of both classes of animals, must be ascertained on the conclusion of the period of feeding; the quantities of food used in the experiment must be specified, and a calculation given of the expense of the two kinds of feeding. The quality of the meat to be stated when the competitor has it in his power to do so. Reports to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

## 20. FORESTS OF LARCH.

For the best and approved Essay on the more extensive cultivation of the Larch (*Larix communis*) in Scotland, particularly in reference to the expediency of forming extensive forests of that tree in the Highlands, with a view of supplying the Navy with timber.—The Honorary Gold or Silver Medal, according to the merits of the communication.

Although the utility of Larch as naval timber is generally admitted, any additional evidence on the subject may with propriety be adduced. The Essayist will also be expected to point out the various situations or localities that may be deemed most suitable for the purpose, including an account of the soils, subsoils, rocks, and geological character of the Districts. The elevation above and distance from the sea should be stated as accurately as possible.

It will be of importance that particular notice be taken of the kind of soils and subsoils where the Larch has been found to form sound timber, and where it has proved liable to disease.

Competitors are referred to the Report on the Duke of Atholl's Plantations, published in the ninth volume of the Society's Transactions. In the essays to be now communicated the information must be original.

Essays to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

21. ON PLANTING WITHIN THE INFLUENCE OF THE SEA.

The Gold Medal, or Plate of the same value, will be given for the best Essay on successful Planting within the influence of the Sea, founded on extensive observation of the habits and appearance of the different sorts of Trees best suited for the purposes desired.

Great disappointments having arisen to landed proprietors, in many parts of the coasts of this country, in planting waste ground near the sea, the above Premium is offered with a view of directing attention to the subject.

Essayists are particularly desired to specify the kinds best suited, and to state the locality where such are to be seen, also the nature of the soil, elevation, &c. The Essays to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

22 SHELTER FOR SHEEP.

The Gold Medal, or Plate of the same value, will be given for the best and approved Essay, founded on actual experience or observation, shewing the advantages arising from affording suitable shelter to sheep in elevated districts, and of supplying them with hay, turnip, or other food during the winter and spring months; and on the most efficient and economical mode of accomplishing these objects.

The author will be expected to detail the kind and description of shelter which has been found most advisable, the kind and quantities of artificial food which have been found most suitable, and any other particulars connected with the management, to which attention should be directed. Essays to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

23. ON THE COMPARATIVE MERITS OF THE CROSS BETWEEN THE LEICESTER RAM AND CHEVIOT EWE, AND OF THE CROSS BETWEEN THE COTSWOLD RAM AND CHEVIOT EWE.

The Gold Medal, or Plate of the same value, will be given for the best and approved Report, founded on actual experiment, on the comparative merits of the produce of the Cross between the Leicester Ram and Cheviot Ewe, and of the cross between the Cotswold Ram and Cheviot Ewe.

The Society having received a favourable account, founded on experiments tried on a small scale, of the merits of the Cross be-



tween the Cotswold Ram and Cheviot Ewe, as compared with that between the Leicester and Cheviot, are desirous of having the result accurately tested, and with that view have offered the premium as above.

The Reports will be expected to contain an account of the comparative merits of the animals in every respect, when Lambs or Hogs, as well as when Shearlings, as regards shape, weight, quality of wool, aptitude for feeding, and hardiness of constitution.

The Reports to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6

#### 24. BOTHEY SYSTEM.

The Gold Medal, or Plate of the same value, will be given for the best and approved Essay on the evils resulting from the present Bothey System for unmarried Farm Servants, as existing in certain Districts of the country, with suggestions for their prevention and cure.

Essays to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

#### 25. SAVING OF LIQUID MANURE.

The Gold Medal, or plate of the same value, will be given for the best and approved Report, founded on practical experience, of the advantages arising from the application of Liquid Manure to the purposes of agriculture; and on the most efficient and economical mode of constructing Tanks, or other receptacles for collecting and saving the same in Farm Steadings

Reports to be lodged on or before 25th October 1840, under the conditions on pages 5 and 6.

#### 26. REPORTS ON IRRIGATION.

The Gold Medal, or a piece of Plate of the same value, will be given for the best and approved account of the Management of Water Meadows, founded on actual experiment within three years preceding the date of the Essay.

The experiments to be made on not less than five acres, whether detached or otherwise, and a description to be given of the rills or streams employed, and of the quality of the water, and of the manner of collecting and applying it, also an account of the land prior to introduction of irrigation upon it, and of its estimated value at that period, and at the time when the Report is made; certified statements to be made of the quality of grass, if any, cut

green in the spring, and the quantity and quality of the hay and aftermath produced upon the portion reported on, and the kind of stock, if any, which has been allowed to depasture it.

The Essays, accompanied by a specimen of the hay produced that season, to be lodged on or before the 20th October 1841, under the conditions on pages 5 and 6.

#### 27. ON RAISING IMPROVED VARIETIES OF GRAINS.

For a Report, founded on actual experiment, detailing the means which may have been successfully employed by the Reporter, for obtaining new and superior varieties of Grains, or improved subvarieties of those at present in cultivation, either by a minute attention to the selection of seeds by hybridation, or such other means as may have been found efficacious—The Gold Medal, or Plate of the same value.

It is necessary that the varieties or subvarieties reported upon, shall have been proved capable of permanent reproduction from seed, that the means employed for obtaining them be minutely stated, and also the relation they bear to others, or well-known sorts; the Reporter is farther requested to state the effects that he may have observed different soils, manures, &c. to produce on certain varieties of grains, and how far he may have ascertained such effects to be lasting.

Reports to be lodged on or before 20th October 1841, under the conditions on pages 5 and 6.

#### 28 FEEDING OF FARM HORSES ON RAW AND ON PREPARED FOOD.

It having been represented to the Society, as the result of careful observation, that Farm Horses sooner attain good condition, though doing the same work, when fed with a given quantity of boiled or steamed Food, than when the same quantity is given to them in a raw state, the Society, desirous that this point, which accords with some recent scientific discoveries, should be further investigated, offers the following Premium:—

Twenty Sovereigns, or a piece of Plate of that value, will be given to the person who shall furnish the best and approved account of an experiment or experiments shewing how far the above statement is well founded. Competitors will be allowed to make the experiments with any of the usually cultivated descriptions of grain, such as Wheat, Barley, Oats, Beans, or Pease, and also with Sago, or other substances, and it is desirable that the ac-

counts furnished should embrace as great a variety of these as possible.

Reports to be lodged by 20th October 1841, under the conditions on pages 5 and 6.

#### 29. SHEEP PASTURES AT HIGH ELEVATIONS.

For the most satisfactory account of the Plants constituting the Herbage on very elevated and mountainous Sheep Pastures in Scotland, where Wedders are believed to thrive and fatten, so as to afford the finest mutton, and a similar account of the Plants constituting the old Pastures at the bases of mountains, understood to be favourable for Milch Cows, and adapted for the fattening of Cattle—A Gold Medal, or a piece of Plate of its value, in the option of the Competitor.

Some of the most elevated Sheep Pastures in Scotland, from 2000 to 3000 feet above the level of the sea, are considered by many sheep farmers to afford most nutritious herbage for feeding and fattening of prime wedders; such are those on the side of Benvoirlich, on the south-west of Strathconnan, on the high hills of Kintail, and on Benlawers in Perthshire. Various kinds of musci and lichens and other plants are intermixed with the alpine grasses at those heights. It is required that the botanical and common names of all the plants, phænogamous and cryptogamous, constituting the pasturage, should be given, and that their proportional abundance should be specified as nearly as can be guessed. Dried specimens of the plants will also be required, with their names attached. Botanists visiting those lofty districts may learn from the more intelligent and observing shephords their opinions as to the nutritive qualities of the plants, or at least of particular districts of pasturage where certain plants chiefly abound. Minute inquiry should be made as to the kinds of mosses and lichens observed to be most readily and greedily cropped by the sheep, and the period of the year when the plants grow most vigorously. The occurrence of sea-shore plants (belonging, for example, to the genera *Statice* and *Plantago*) on these elevated stations should be adverted to, salt herbage being accounted both nutritious and fattening.

It has been remarked, that old pastures near the bases of mountains, which always contain, among the gramineous plants, an intermixture of various musci, afford excellent food for milch cows, the milk proving both plentiful and rich; and that such old mossy pastures are said to fatten cattle more readily than recent

artificial pastures. The musci in these should be examined and compared as to their qualities with those found on the more elevated sheep-walks, and specimens should also be transmitted.

To be lodged on or before the 20th October 1841, under the conditions on pages 5 and 6.

30. SAVING OF TANNIN IN PREPARING THE BARK OF OAK COPSE.

According to the usual practice in the cutting of Oak Copse, and in the preparation of the Bark, the small branches, &c. are allowed to go to waste. As the bark and wood of those parts of the trees are stated to contain a large quantity of Tannin, it becomes an object to turn them to account, and the Society therefore offers the following Premium, viz. Ten Sovereigns, or a Piece of Plate of that value, for the best and approved Essay on the most efficient and economical plan for rendering available the Tannin contained in the bark and wood of the branches of oak copse.

An account must be given of the relative proportion of wood and bark in the branches, and of the quantity of tannin which may be obtained from each respectively; and a description must be furnished of the best mode of collecting and preparing the tannin for transportation to market.

Essays to be lodged on or before 20th October 1841, under the conditions on pages 5 and 6.

31. SALINE CONSTITUENTS OF PLANTS.

Twenty Sovereigns, or a piece of Plate of that value, will be given for the best and approved Essay, founded upon chemical analysis, on the following question:—To what extent can the Earthy and Saline Matter of Plants vary, both as to its chemical nature and the proportion of its various ingredients, without affecting the health and vigour of the plants themselves?

The subject is to be exemplified by the accurate chemical analysis of the earthy and saline constituents of several healthy specimens of at least four of the most important crops; the specimens chosen having been cultivated upon soils of different natures, and a careful comparison made between the various results.

Essays to be lodged on or before the 20th of October 1841, under the conditions on pages 5 and 6.

32. RADICAL EXCRETIONS OF PLANTS.

The Gold Medal and Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best and approved Essay on

the Radical Excretions of different Plants, or the various substances discharged from their Roots. Decandolle, Macaire, and others, from various experiments, have been led to suppose that different excretions are discharged from the roots of plants, which may probably account for their defects in deteriorating the soil for the production of the same species. The Essays are expected to give the result of original experiments determining the fact whether or not such excretions take place, and, if this is the case, to ascertain the chemical nature of the matter excreted from different plants, more especially the cultivated Gramineæ, Leguminosæ, and Cruciferæ.

Essays to be lodged on or before the 20th of October 1841, under the conditions on pages 5 and 6.

### 33. INVESTIGATION OF CERTAIN POINTS CONNECTED WITH THE SCIENCE OF AGRICULTURE.

In addition to the Premiums Nos. 31 and 32, and other particular subjects announced, the Society being desirous of encouraging such inquiries, and being aware how little is known with regard to some of the fundamental principles of Agriculture, will receive with favour, and reward liberally, Essays or Memoirs on any of the following subjects, the precise amount of the Premium being fixed by the Directors according to their opinion of the merits and value of the respective Essays.

With a view to this important object, the Society have set apart Fifty Sovereigns annually, to be awarded for such approved communications as may be lodged on any of the subjects referred to. In the event of papers being communicated in any year which shall appear to merit a sum greater than the Directors have at their disposal, some of these papers will be directed to stand over to receive rewards in a future year.

1. An Essay or Memoir explaining, on scientific principles, the mode in which Soil operates in producing or facilitating the Germination and Growth of Vegetables.

2. An Essay or Memoir describing and proving, on scientific principles, what is the best admixture of the ordinary elements of Soil for promoting the Germination and Growth of particular Vegetables.

3. An Essay or Memoir describing, on scientific principles, the mode in which lime operates in rendering the Soil better adapted for the Germination and Growth of particular Vegetables.

4. An Essay or Memoir explaining, on scientific principles, the

effect of Drainage in altering the constitution or qualities of the Soil, and increasing its fertility.

5. An Essay or Memoir shewing the nature of the Atmospheric Influences on Soil in promoting its fertility, including the modification of these influences arising from heat and cold, dryness and moisture.

NOTE.—It is expected, and is to be explicitly understood, that the authors of the above Essays will not offer mere speculative conjectures on the subjects treated of, and far less make a compilation of the opinions of others. They must be able to state, that they have themselves studied and investigated the subject treated of. They must also explain the nature and the mode of inquiry adopted by them, and detail the experiments which they have instituted, from which their inferences have been derived. The Essays or Memoirs to be lodged by the 20th of October in any year, under the conditions on pages 5 and 6.

#### 34. REPORTS ON IMPROVED RURAL ECONOMY ABROAD.

The Honorary Gold or Silver Medal of the Society, according to the value of the communication, will be given for approved accounts, founded on personal observation, of any useful practice or practices in Rural or Domestic Economy adopted in other countries, which may seem fitted for being introduced with advantage into Great Britain.

However advanced the state of the Useful Arts may be considered in this kingdom, it is not to be doubted that there are many practices in use, both of Domestic and Rural Economy, in other countries, and particularly in France, the Low Countries, and the North of Germany, highly deserving of attention or imitation, and which are yet too apt to be disregarded or unnoticed by the traveller or casual resident. The purpose chiefly contemplated by the offer of the present Premium, is to induce gentlemen who may visit other countries to take notice of and record such particular practices as may seem calculated to benefit their own country in the branches of the arts referred to; and it is proposed that the earliest opportunity shall, in all cases, be taken of communicating such details to the public.

#### 35. HONORARY PREMIUM FOR REPORTS ON CERTAIN DISTRICTS IN SCOTLAND.

To the person who shall, on or before the 20th October in any year, furnish to the Society the best account of a District in Scotland remarkable for any striking improvements that have been lately effected in it, whether with reference to its Husbandry, or

to the establishment of useful Manufactories, of Fisheries, or of additional facilities for External or Internal Communications, such as Harbours, Railroads, or other means of public conveyance, including the state and management of Public Roads, and generally of such other improvements as have a direct tendency to increase the Physical Resources of the District—The Society's Gold or Silver Medal, or a piece of Plate, as the Directors may see fit in the circumstances of the case.

The report is expected to be given from the writer's experience or observation, and the extent of the district reported upon is not to be less than fifty square miles.

In describing the present state of husbandry, authors are required to advert to the general character of the surface in regard to its being rocky, or consisting of soil ; and, in describing the latter, they must state by what means it appears to have been formed, whether by disintegration of the subjacent or adjoining strata, or by transportation from other localities. The authors must also mention, and describe generally, the kind of trees which appear to thrive best within the district, and they must state whether, and what different kinds shew the most rapid and vigorous growth on the several descriptions of soil. They must also give an account of the prevailing native plants on uncultivated situations. Some account must likewise be given of the improvements made, or in progress, in the methods of tillage, the breeds of stock, the modes of cropping, the progress and methods of drainage, and the like. They will also give a particular account of any advantageous modes of managing estates and conducting their improvement, which may have been adopted by proprietors or their agents in the District.

Where Peat-mosses occur in the District, the author will be expected, not only to describe their extent, depth, quality, and general character, subsoil on which they rest, and susceptibility of improvement, but also any remarkable particulars regarding their component parts, such as the kind of wood, nuts, plants, or leaves which prevail, or their accidental extraneous contents, such as horns, or any remains of works of art.

In reference to the offer of the Premium, which is alternately made for *Manufacturing Improvements* in a District, authors must, in describing these, not only state the nature of the commodity or article manufactured, but also the nature of the machinery, and other means by which the manufactory is carried on ; the number of persons of different sexes and ages employed, the value of the manufactory, the markets to which the articles manufactured

are sent, the nature of the raw materials, and the source or sources whence they are respectively derived.

Authors, in treating of either kind of improvements, according as their knowledge and experience may best enable them, are required particularly to state the effects which have been thereby produced, not merely in respect of the annual revenue thence accruing, but also on the moral, social, and physical condition of the inhabitants. The authors should, in their accounts, mention the elevation of the principal points of the district above the sea. They are likewise invited to offer suggestions for the future improvement of the district, whether physically or morally.

It is further expected, that authors, if the district they undertake to give an account of happen to have been already described in any well-known publication, will avoid repeating the information which can be found there, and merely refer to such publication.

#### CONDITIONS OF COMPETITION FOR ESSAYS AND REPORTS.

The Conditions of Competition for Essays and Reports will be found under the "Notice to Candidates," on pages 5 and 6, to which Competitors are particularly referred.

The Essays and Reports on subjects 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, and 25, are to be lodged on or before the 20th October next, 1840; those on subjects 26, 27, 28, 29, 30, 31, and 32, by 20th October 1841; and those on subjects 33, 34, and 35, by 20th October in any year.

### CLASS III.

#### WASTE LANDS.

##### 1. IMPROVEMENT OF A SPECIFIED EXTENT OF WASTE LAND BY TILLAGE.

To the Proprietor or Tenant in Scotland who shall, on or before the 20th of October in any year, transmit to the Society the most satisfactory Report of having successfully improved and brought into profitable tillage, within a period of five years immediately preceding the date of his communication, an extent of waste and hitherto uncultivated Land, not being less than one hundred acres—The Gold Medal

To the Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society a satisfactory Report of having, within the period of three years preceding the



date of his Report, successfully improved, and brought into profitable tillage, an extent of waste and hitherto uncultivated Land, not being less than thirty acres on the same farm—The Honorary Silver Medal.

The Reports in competition for both Premiums may comprehend such general observations on the Improvement of Waste Lands as the writer's experience may have led him to make, but they are required to refer especially to the land reclaimed (which, if not in one continuous tract, must be in fields of considerable extent), to the nature of the soil, the previous state and probable value of the ground, the obstacles opposed to its improvement, the mode of management adopted, the expense, and, in so far as can be ascertained, the produce and value of the subsequent crops; and the land must have borne one crop of grain, at least, previous to the year in which the Report is made. The Reports must be accompanied by a detailed statement of the expense, and by a certified measurement of the ground. Competitors for the more limited extent improved will observe, that, having gained the Silver Medal, it shall not afterwards be competent to include the same improvement in a subsequent claim for the Gold Medal. Competitors for both Premiums will attend to the general conditions, which will be found on pages 5 and 6.

## 2. IMPROVEMENT OF A SPECIFIED EXTENT OF WASTE LAND FOR PASTURE

To the Proprietor or Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society the most satisfactory Report of having, within the period of five years immediately preceding the date of his communication, successfully improved an extent of waste and hitherto uncultivated Land, not being less than one hundred acres, by draining, accompanied with irrigation or top-dressing with lime or other substances, or paring and burning the surface, and sowing grass seeds with or without a grain crop—The Gold Medal.

To the Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society a satisfactory Report of having, within the period of three years preceding the date of his Report, successfully improved for pasture an extent, not being less than thirty acres on the same farm, of waste and hitherto uncultivated Land, in the manner indicated in reference to the immediately preceding Premium—The Honorary Silver Medal.

The Reports are required to advert to all the particulars specified in the conditions in the Premiums for the improvement by tillage, so far as these are applicable to the improvement of land for pasture; and the land must have been hayed or pastured three years at least previous to the year in which the Reports are made. The Reports must be accompanied by a detailed statement of the expense, and by a certified measurement of the ground. Competitors for the more limited extent will observe, that, having gained the Silver Medal, it shall not afterwards be competent to include the same improvement in a subsequent claim for the Gold Medal. Competitors for both Premiums will attend to the general conditions on pages 5 and 6.

## CLASS IV.

### CROPS AND CULTURE.

#### 1. NEW PLANTS ADAPTED TO FIELD CULTURE.

To the person who shall, on or before the 20th October in any year, report to the Society any new species or variety of useful Plant, adapted to the ordinary field culture of Scotland—The Gold or Silver Medal, or a Piece of Plate, as the Directors may see fit in the circumstances of the case.

Particular attention is directed to the raising or procuring of new varieties of Cereal Grains, as well as of the more useful Herbage and Forage Plants; in the latter class a new variety of Italian Rye-grass, possessing the qualities of bulk of produce, permanency of duration, or other advantages calculated to render it superior to the common sort, will be considered an acquisition.

Satisfactory evidence will be required that the plant produced is new in the cultivation of the country; either as regards the species or variety, valuable as regards the uses to which it may be applied, and congenial to the soil and climate of Scotland. A particular detail of the discovery, or circumstances which led to the experiment, must be furnished, the mode of culture described, and a specimen of the plant transmitted; with such suggestions as to the probable value of its straw as experience may have enabled the competitor to afford.

#### 2. SAVING HAY.

To the person in Scotland who shall in any one year have stacked not less than 500 Stones of Hay in the best condition,

the produce of his own farm, or of the farm of which he is in charge—The Silver Medal.

In order to draw the attention of practical Agriculturists to the Saving of Hay, and to the papers on the subject which have been published in the Society's Transactions, six honorary appropriate Silver Medals will be assigned for three years successively upon the applications first lodged, and in the order in which they are applied for, under the following conditions:—

A certificate must be lodged with the Secretary by any two Members prior to the Summer half-yearly General Meeting of the Society, that not fewer than three persons have agreed to compete in any district during that season for some one description of Hay, whether Clover and Rye-grass, Natural Grass, Watered Meadow, or Upland; and that the competitors had agreed in naming a Judge to decide upon the quality of the Hay for which they intend to compete. The Judge to be so named shall inspect the Hay, and give his decision in writing betwixt the 1st and 20th of January following, and will award the Medal for the Hay of the best quality and in the best condition, if he shall be of opinion that any competitor merits it. A report of the award, accompanied by an account, to be furnished by the successful competitor, of the mode of treatment followed by him, and particularly of the time which elapsed betwixt the mowing and stacking, and whether the Hay was put into tramp ricks or carried at once to the stack, shall be immediately transmitted to the Secretary by the Members of the Society who signed the certificate; and on the receipt of the Report, the Secretary will forward the Medal to be delivered to the successful competitor.

### 3. STRAW PLAIT.

1. To the person who, in the years 1840 or 1841, shall have reaped and prepared in the best manner for Straw Plait, in any District of Scotland where Premiums for the preparation and manufacture of that article have not already been awarded by the Society, the greatest quantity of Rye Straw, on not less than two acres—Ten Sovereigns, or a Piece of Plate of that value

Competitors to lodge with the Society, on or before the 20th of November 1841, average samples of their prepared Straw, accompanied by authenticated measurements of the ground upon which the crop was raised, with statements explanatory of the management throughout, of the nature and value of the soil, and of the value of the produce.

It has been represented to the Society, that rich or superior soils are unsuited to the growth of Rye Straw for Plait, and that waste sandy links, and inferior light soils in low or early situations, such as are frequent along both sides of the Firth of Forth, and other parts of the coast, are those on which its growth is most likely to prove profitable.

2. To the person who shall, between 30th January 1840 and 20th November 1842, have got Plaited or Manufactured, in any district of Scotland where Premiums for this branch of industry have not been already awarded by the Society, the greatest quantity of Rye Straw—Six Sovereigns.

To the person who shall have got Plaited or Manufactured the second greatest quantity as aforesaid—Four Sovereigns.

Competitors to produce certificates by two Members of the Society, attesting the quantity manufactured, and transmit samples of the different kinds of Plait made. They will also lodge an account of the expenditure and market value of the manufactured article, with information as to the class of persons employed, amount of their daily earnings, and such information generally as may be considered will forward the object in view, of encouraging the improvement of the female, juvenile and infirm portion of the labouring classes, by introducing habits of cleanliness and industry. Claims to be lodged by 20th of November 1842.

#### 4. PLOUGHING COMPETITIONS.

Premiums to Ploughmen for improvement in Ploughing having for some years been given very generally over the country by the resident Gentlemen and Local Farming Societies, the Highland and Agricultural Society has, in the mean time, discontinued them; but being desirous of encouraging improvement in this branch of husbandry, the Society will give its Silver Plough Medal to the Ploughman found to be the best at such competitions, provided not fewer than fifteen Ploughs shall have started, and that Premiums in money to an amount not less than Three Sovereigns shall have been awarded. It shall be competent to the Judges of the competition, in deciding on the merits of the competitors, to take into consideration the time occupied in ploughing the ground assigned to the competitors respectively. The Medal will be issued upon a report from one or more Members of the Society, who shall have actually attended the competition, stating

the number of Ploughs that had started, the number and amount of the money Premiums awarded, and that the Ploughman found to be the best had not received the Society's Medal at a previous competition in the same district.

The Report must be lodged with the Secretary, at the Society's Hall, within three months after the Competition, otherwise the Medal will not be issued.

## CLASS V.

### PASTURES.

#### I. MANAGEMENT OF PASTURE LANDS.

The Gold Medal, or a Piece of Plate of the same value, will be given to the Proprietor or Tenant in Scotland who shall, on or before the 10th of November in any year, report to the Society the most successful Management of Pasture Lands, founded on practice.

The land, forming the subject of the Report, must have been pastured for at least three seasons, exclusive of that in which the Report is given in, and the extent of ground must not be under ten acres. If the land has been sown down within a period of eight years previous to that in which the Report is made, the reporter will be required, besides stating the mode adopted in laying down, and the kinds and quantities of seeds used, to give a correct detail of the management from the period of sowing until the land be sufficiently consolidated for the purpose of being depastured. In any case, the reporter will be required to state the kind and quality of the soil, with its exposure and elevation, the mode of drainage, and the various proportions of grasses and other plants constituting the pasture; the means which have been employed in maintaining or increasing the productiveness of the herbage by top-dressing or otherwise; the description of stock grazed; and the modes which have been found most successful in practice, of preventing or destroying the growth of plants injurious to the pasture.

Competitors are referred to the general conditions, which will be found on pages 5 and 6.

CLASS VI.

LIVE STOCK—DISTRICT COMPETITIONS.

§ I. CATTLE.

PREMIUMS FOR IMPROVING THE BREED OF CATTLE IN THE FOLLOWING DISTRICTS:—

1. *The Districts of Eskdale and Liddesdale, in the Counties of Dumfries and Roxburgh.*
2. *The Islands of North and South Uist, Harris, Barra, and small Isles adjacent, in Inverness-shire.*
3. *The Districts of Breadalbane, Glenorchy, Glenlyon, Glenochy, Glendochart, Glenfalloch, and Rannoch, comprehending the parishes of Kenmore, Killin, Glenorchy, Fortingall, Dull, Weem, and Logierait, in the Counties of Perth and Argyll.*
4. *The District of Garioch, Aberdeenshire.*
5. *The Eastern District of Fifeshire, comprehending the parishes of Kilconquhar, Elie, St Monance, Pittenweem, Carnbee, East Anstruther, West Anstruther, Kilrenny, Orail, Kingsbarns, St Andrews, Denino, Cameron, Leuchars, Newburn, Largo, Leven, Scoonie, Forgan, and Ferry-port-on-Oraig.*
6. *The Parishes of Inveravon, Kirkmichael, Mortlach, and Aberlour, in Banffshire, and Cabrach and Knockando, in Aberdeen and Moray shires.*
7. *The Counties of Moray and Nairn.*
8. *The District of Turriff, in the Counties of Aberdeen and Banff.*
9. *The County of Linlithgow.*
10. *The District of Auchtermuchty, Fifeshire, comprehending the Parishes of Auchtermuchty, Falkland, Strathmiglo, Newburgh, Abdie, those parts of the Parishes of Arngask and Abernethy, in the County of Fife, and those parts of the Parishes of Collessie and Kettle lying to the westward of the Turnpike Road leading from New Inn by Trafalgar to Newburgh.*
11. *The Counties of Stirling and Clackmannan, and that part of the County of Perth which is under the jurisdiction of the Sheriff-Substitute of the Dunblane District.*
12. *The District of Formartin, in Aberdeenshire.*
13. *The County of Renfrew.*
14. *The Parishes of Banclachy Ternan, Strachan, Birse, Kincardine O'Neil, Echt, Peterculter, Drumoak, Durris, Maryculter, Lumphanan, and Midmar, in the Counties of Aberdeen and Kincardine.*

15. *The Parishes of Cargill, Collace, Kinclaven, Cupar-Angus, Bendochy, Blairgowrie, Alyth, Ruthven, Airlie, Glamis, Essay, Neway, Meigle, Newtyle, Kettins, and Caputh, in the Counties of Perth and Forfar.*
16. *The Parishes of Maybole, Kirkmichael, Straiton, Daily, and Kirkcaldy, in the County of Ayr.*
17. *The County of Sutherland.*

For the best Bull, from two to seven years old, to be exhibited at the Competition in each of the four Districts, Nos. 2, 3, 6, and 17, as above described, *bona fide* the property of a Proprietor, Factor, or Tenant, and kept in his possession from the 20th day of May preceding the Competition—The Honorary Silver Medal.

For the best Bull, from two to seven years old, *bona fide* the property, and in possession, of any Tenant in each of the said four Districts, Nos. 2, 3, 6, and 17, kept on his farm within the District, from the 20th day of May preceding the Competition—Ten Sovereigns.

For the second best Bull, of the same age, in each of the said four Districts, the property, and in the possession, of any Tenant, and kept on his farm within the District for the foresaid period—Five Sovereigns.

For the best two Queys of three years old, the property of, and bred by, any Tenant in each of the three Districts, Nos. 2, 3, and 17, above described—Five Sovereigns.

For the second best two Queys of three years old, the property of, and bred by, any Tenant in each of the said three last-mentioned Districts—Three Sovereigns.

For the best two Queys of three years old, the property, and in possession, of any Tenant in the said District No. 6, above described, from the 20th day of May preceding the Competition, and which shall be kept by him within the District for at least one year after the award of the Premium—Five Sovereigns.

For the second best two Queys of three years old, the property, and in possession, of any Tenant in the said last-mentioned District, to be kept as aforesaid—Three Sovereigns.

For the best Bull, from two to seven years old, *bona fide* the property, and in possession, of any Proprietor or Tenant, in each of the thirteen Districts, Nos. 1, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16, as above described, kept on his farm, within the District, from the 20th day of May preceding the Competition—Ten Sovereigns.

For the second best Bull, of the age above specified, *bona fide*

the property, and in possession, of any Proprietor or Tenant, in *each* of the said thirteen Districts, and kept on his farm, within the District, for the aforesaid period—Five Sovereigns.

For the best two Queys of two years old, the property of, and bred by, any Tenant in *each* of the said thirteen Districts, Nos. 1, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16—Five Sovereigns.

For the second best two Queys of two years old, the property of, and bred by, any Tenant in each of the said thirteen Districts—Three Sovereigns.

The Competition in the Districts Nos. 1 to 11, both inclusive, will take place in 1840, and in Nos. 12, 13, 14, 15, 16, and 17, in 1841.

The following Members of the Society (as Members only, or their Factors in their absence can be named), are hereby appointed Committees for regulating all details at the Competition for the eleven Districts first above mentioned. In Districts Nos. 12 and 13, Committees were named in the advertisement of 1839, and the Committees for the Districts Nos. 14, 15, 16, and 17, will be intimated in that of 1841.

**FOR THE FIRST DISTRICT.**—The Duke of Buccleuch; Lord John Scott; the Right Hon. Sir James Graham, Bart. M. P.; J. J. Hope Johnston, Esq. M. P.; William Blamire, Esq. formerly M. P. for Cumberland; Thomas Chalmers Borthwick, Esq. of Hopesrig; G. Scott Elliot, Esq. of Larriston; Geo. Bell, Esq. Woodhouselees; A. H. Maxwell, Esq. of Portrack; W. Oliver Rutherford, Esq. of Edgerston; Major Oliver of Bush; Thomas Stavert, Esq. of Hosecoat; Alexander Scott, Esq. of Knockhill; Alexander Stevenson, Esq. Banker, Langholm; *and any other Members in the District*; three a quorum. The Duke of Buccleuch, in his absence Mr Scott Elliot, to be Convener.

**FOR THE SECOND DISTRICT.**—Lord Macdonald; R. G. Macdonald, Esq. of Clanranald; R. MacNeill, Esq. of Barra; R. Macdonald, Esq. of Bornish; Donald Maclean, Esq. of Borreray; Duncan Shaw, Esq. factor to Lord Macdonald; Charles Shaw, Esq.; Mr Stewart Harris; *and any other Members in the District*; two a quorum. Lord Macdonald, in his absence Mr Duncan Shaw, to be Convener.

**FOR THE THIRD DISTRICT.**—The Marquis of Breadalbane; Sir Neil Menzies, Bart.; Sir Wm. Drummond Stewart, Bart.; Major-General Sir Archd. Campbell, Bart. G. C. B.; Archibald Butter, Esq. of Fascally; The Rev. T. Buchanan, Logierait; J. L. Campbell, Esq. of Glenfalloch; Archibald Campbell, Esq.



factor on the estate of Menzies; Colonel J. Macdonald of Dalchoisnie; James Menzies, Esq. of Pitnacree; John Menzies, Esq. of Chesthill; Major Archibald Menzies, late 42d Regiment; Mr Cumming Menzies, of Knockintober; Alexander Stewart, Esq. of Derculich; Alexander Stewart, Esq. of Glencribisdale; Robert Stewart, Esq. of Airdvorlich; George Stewart, Esq., Grandtully; John Stewart, Esq. of Findynate; W. B. Campbell Stewart, Esq. of Clochfoldich; James Stewart Robertson, Esq. of Edradynate; Robert Robertson, Esq. of Auchleeks; Mr Stewart, Chesthill; Mr Wyllie, Bolfracks; *and any other Members in the District*; five a quorum. The Marquis of Breadalbane, in his absence Sir Neil Menzies, to be Convener.

**FOR THE FOURTH DISTRICT.**—The Earl of Kintore; Sir John Forbes, Bart. of Craigievar; Sir R. D. Horn Elphinstone, Bart.; Lieutenant-General Sir A. Leith of Freefield; John Burnet, Esq. of Kemnay; Colonel W. H. Knight Erskine of Pittodrie; Captain Elphinstone Dalrymple of Westhall; Colonel Fraser of Castle Fraser; David John Gordon, Esq. of Wardhouse; James Gordon, Esq. of Manar; Robert Grant, Esq. of Tillyfour; Lieut.-Colonel Sir Andrew Leith Hay of Rannes; Patrick Irvine, Esq. of Inveramsay; George Leslie, Esq. of Rothie; William Leslie, Esq. of Warthill; H. Leith Lumsden, Esq. of Auchindoir; Hugh Lumsden, Esq. of Pitcaple; R. Mackenzie, Esq. of Glack; J. Mackenzie, Esq. younger of Glack; B. C. Urquhart, Esq. of Meldrum; Mr Walker, Suttie; *and any other Members in the District*; five a quorum. Sir R. D. H. Elphinstone, in his absence Mr Lumsden of Pitcaple, to be Convener.

**FOR THE FIFTH DISTRICT.**—Lord William Douglas; Sir Ralph Anstruther of Balcaskie, Bart.; Sir David Erskine of Cambo, Bart.; Sir Henry Bethune, of Kilconquhar, Bart.; Major Anderson of Kingask; Gilbert Bethune, Esq. of Balfour; Lieut.-Colonel Briggs of Strathairly; Robert Bruce, Esq. of Kennet; William Berry, Esq. of Tayfield; George Cheape, Esq. of Wellfield; Alexander Chrystie, Esq. Elio Lodge; H. Craigie, Esq. of Hallhill; George Duncan, Esq., Balchrystie; J. B. Fernie, Esq. of Kilmux; William Graham, Esq. of Greigston; Charles Craigie Halket, Esq. of Hallhill; Norman Hill, Esq. of Brownhills; Captain Kerr of Grange; Lieutenant-Colonel Lindsay, younger of Balcarras; The Rev. E. S. Lumsdaine of Blarnerne and Invergelly; James Lumsden, Esq. of Lathallan; Thomas Elder MacRitchie, Esq. of Craigton; John Whyte Melville, Esq. of Mount Melville; David Monypenny, Esq. of Pit-

milley; R. Gillespie Smyth, Esq. of Gibliston; James Nairne, Esq. of Claremont; J. Home Rigg, Esq. of Morton; Archibald John Stewart, Esq. of St Fort; John Thomson, Esq. Craigie; Bethune J. Walker, Esq. of Fallfield; John Wood, Esq. factor, Balcarras; James Wyld, Esq. of Gilston; *and any other Members in the District*; five a quorum. Colonel Lindsay and R. Bruce, Esq. of Kennet, in their absence Lieutenant-Colonel Briggs of Strathairly, to be Conveners.

FOR THE SIXTH DISTRICT.—The Duke of Richmond; the Earl of March; the Earl of Fife—the Hon. Colonel Grant of Grant, M.P.; Sir George Macpherson Grant, of Ballindalloch, Bart.; John Macpherson Grant, Esq. yr. of Ballindalloch; William Grant, Esq. yr. of Elchies; Mr Grant Rathven; Colonel Gordon, Inverlochy, C.B.; Arthur Thomas Gregory, Esq. of Buchrumb; Major Stewart, Pittyvaich; Mr Macinnes, Dandaleith; Mr Skinner, Drumin; Mr Gordon, Croughley; Mr MacGregor, Delavorar; Mr Smith, Castleton; Mr Stewart, Deskie, *and any other Members in the District*, three a quorum; Sir George Macpherson Grant, in his absence, Mr Skinner, to be Convener.

FOR THE SEVENTH DISTRICT.—The Duke of Richmond; the Earl of March—the Earl of Moray; the Earl of Cawdor; Viscount Emlyn; Lieutenant-General the Hon. Sir Alexander Duff; the Hon. Colonel Grant of Grant, M.P.; the Hon. John Stuart; Sir A. Dunbar of Northfield, Bart.; Sir W. C. Gordon of Altyre, Bart.; Sir George Macpherson Grant of Ballindalloch, Bart.; Major-General Sir John Rose of Holm; Archibald Dunbar, Esq. younger, of Northfield; P. B. Ainslie, Esq.; Lieutenant-Colonel James Brander of Pitgavenny; James Campbell Brodie, Esq. of Lethen; William Brodie, Esq. of Brodie; Alexander Brown, Esq. Secretary Morayshire Farmer Club; Peter Brown, Esq. Linkwood; Dr James Bayne; C. L. Cumming Bruce, Esq. of Roseile and Kinnaird; William Macpherson Christie, Esq. Ballimore; Hugh Davidson, Esq. of Cantray; Richard W. Duff, Esq. of Orton; John Forsyth, Esq. Forres; Captain William Fraser, Brackla; Robert Fraser, Esq. Brackla; Colonel Gordon, C.B.; Captain Gordon, Revack; F. W. Grant, Esq. younger of Grant; J. Macpherson Grant, Esq. yr. of Ballindalloch; Robert Grant, Esq. of Kincorth; William Grant, Esq. yr. of Elchies; J. Augustus Grant, Esq. of Viewfield; John Gollan, Esq. of Gollanfield; Major-General D. Macpherson, Burgie; Norman M'Leod, Esq. of Dalvey; Lieut.-Colonel D. Macpherson, Ardersier; John M'Innes, Esq. Dandaleith; William M'Intosh, Esq. of Geddes; William M'Killigan, Esq. of Relugas; Graham Speirs, Esq. Sheriff of the County; William Aloxander Stables, Esq. of Park; Francis Smyth, Esq. of

Knockomie; Patrick Sellar, Esq. of Westfield; William Fraser Tytler, Esq. of Balnain; William Young, Esq. of Burghead, *and any other Members in the District*; five a quorum.—Sir A. Dunbar and Robert Grant, Esq. of Kincorth to be Conveners.

FOR THE EIGHTH DISTRICT.—The Earl of Fife; Lieutenant-General the Hon. Sir Alexander Duff; Sir Robert Abercromby of Birkenbog, Bart; John Adam, Esq. Turiff; James Allardes, Esq. Boyndsmill; Alexander Currie, Esq. Sheriff of Banffshire; John Duff Dingwall, Esq. of Brucklaw; Garden Duff, Esq. of Hatton; James Grant Duff, Esq. of Eden; Thomas Abercromby Duff, Esq. of Haddo; Major P. Dunbar of Mountcoffer; Captain Ferguson of Pitfour, R. N.; John Taylor Gordon, Esq. of Nethermuir; William Gordon, Esq. of Fyvie; Alex. Forbes, Esq. of Boyndlie; Alexander Grant, Esq. of Carnousie; James Rose Innes, Esq. of Netherdale; Alexander Keith, Esq. Netherthird; George Leslie, Esq. of Rothie; H. George Leslie, Esq. of Denlugas; Harry Leith Lumsden, Esq. of Auchindoir; James W. Mackenzie, Esq. Pittrichie; George Garden Robinson, Esq. Banff; John Brodie Spottiswoode, Esq. of Muirkirk; Alexander Stewart, Esq. of Laithers; George Campbell Smith, Esq. Banff; B. C. Urquhart, Esq. of Byth and Meldrum; Archibald Young, Esq. Banff; *and any other Members in the District*; five a quorum.—The Earl of Fife, in his absence, James Grant Duff, Esq. of Eden, Convener.

FOR THE NINTH DISTRICT.—The Earl of Rosebery; the Earl of Hopetoun; Lord Dalmeny, M.P.; Sir Thomas Livingstone of Westquarter; Sir James Dalrymple of Binns, and Sir William Baillie of Polkemmet, Barts.; Robert Baillie, Esq. Kinneil; D. C. Cameron, Esq. of Foxhall; Gabriel Hamilton Dundas, Esq. of Duddingstone; David Falconer, Esq. of Carlowrie; George Falconer, Esq. yr. of ditto; W. D. Gillon, Esq. of Wallhouse, M.P.; John F. Hamilton, Esq. of Westport; James M. Hog, Esq. of Newliston; Joseph Hume, Esq. of Horndean and Lochcote; James Johnston, Esq. of Straiton; Major Norman Shairp of Houston; Major J. Kerr Ross of Laurencepark; John Stewart, Esq. of Binny; Peter Thomson, Esq. Hanging-side; William Wilkie, Esq. of Ormistonhill; Alex. Duncan, Glendivine; *and any other Members in the District*; three a quorum. The Earl of Rosebery, in his absence, J. M. Hog, Esq. of Newliston, Convener.

FOR THE TENTH DISTRICT.—The Earl of Leven and Melville; the Hon. William Leslie Melville; O. Tyndal Bruce, Esq. of Falkland; George Cheape, Esq. of Wellfield; Charles Kinnear, Esq. of Kinnear; David Maitland Makgill Crichton, Esq. of Rankellour; Lieutenant-Colonel Millar of Urquhart; Patrick George

Skene, Esq. of Hallyards; Archibald Walker, Esq. Auchtermuchty; *and any other Members in the District*; three a quorum. O. T. Bruce, Esq., and Archd. Walker, Esq. or either of them, to be Conveners.

**FOR THE ELEVENTH DISTRICT.**—The Earl of Dunmore; Lord Abercromby; Hon. George Ralph Abercromby, M.P.; Sir Gilbert Stirling, Bart.; Robert Bruce, Esq. of Kennet; H. Home Drummond, Esq. of Blairdrummond; William Forbes, Esq. of Callander; James Johnstone, Esq. of Alva; John Burn Murdoch, Esq. of Gartincaber; William Murray, Esq. of Polmaise; William R. Ramsay, Esq. of Barnton; C. D. Stirling, Esq. of Glenbervie; *and the other Members in the District*; three a quorum; William R. Ramsay, Esq. of Barnton, and William Murray, Esq. of Polmaise or either of them, to be Conveners.

**FOR THE TWELFTH AND THIRTEENTH DISTRICTS** the Committee remain as last year, with the addition of those resident Members since elected.

**IN THE FOURTEENTH DISTRICT.**—Sir Thos. Burnett of Leys, Bart. in his absence, William Innes, Esq. of Raemoir, to be Convener.

**IN THE FIFTEENTH DISTRICT.**—Sir J. Muir Mackenzie of Delvine, Bart. in his absence, Mr Watson, Keillor, to be Convener.

**IN THE SIXTEENTH DISTRICT.**—Sir Charles Dalrymple Fergusson of Kilkerran, Bart., in his absence, Elias Cathcart, Esq. of Auchindraue, to be Convener.

**AND IN THE SEVENTEENTH DISTRICT.**—The Duke of Sutherland, in his absence, George Gunn, Esq. Rhives, to be Convener of the Committee of resident Members.

#### RULES OF COMPETITION.

1. The Conveners, with the approbation of a quorum of the Committees for conducting the several competitions, are respectively authorized, in such cases as they shall see proper, to divide the two Premiums allowed for Bulls into three Premiums, in such proportions as they shall approve; the first Premium for Bulls not being less than Eight Sovereigns; and, in like manner, to divide the sums allowed for Queys into three Premiums, fixing their amount.

2. The Committee shall not place for Competition any Stock which, in their opinion, does not fall within the regulations prescribed, or does not possess merit; and in no instance shall any of the Money Premiums be awarded, where there are not, after such selection, at least three Competitors, reserving to the Committee, in the case here provided for, to make such allowance to a party showing stock of merit, not exceeding half the amount of the Premium, as under the circumstances they may think reasonable.

3. The times and also the places of Competition are to be fixed by the Convener, with the advice of at least a quorum of their respective Committees, except in the 2d and 7th Districts, as to which Benbocula is named as the place of Competition for the former, and in the latter Elgin and Fortes alternately are fixed. The Competition for the Society's and for the District Premiums are to take place between the 1st of June and 1st day of November next.

4. The Convener of each Committee will give timely notice to the other Members of the Committee of the place and time of the Competition, and will be particularly careful that the same be intimated at the several parish church-doors within the District, for at least two successive Sundays previous to the Competition, or in such other form as shall be previously approved of by the Local Committee.

5. As these Premiums were given, in some of the above-mentioned Districts, in 1835, 1836, 1837, 1838, and 1839, it is to be observed, that the Society does not admit an animal, in any class of Stock, which may have gained the Society's first Premium at a District or General Show in a former year, to be again shown in Competition in any District; and for no description of Stock shall either the same or a lower denomination of Premium be awarded, in the District in which they have already gained a Premium. In those Districts where the Honorary Silver Medal is offered for Bulls, Tenants cannot compete with the same animal both for the Honorary and the Money Premiums.

6. No member of the Committee shewing Stock of his own at the Competition shall act as judge; nor shall Factors, when they are members of the Society, and are named on the Committee, or when acting in the absence of Proprietors, be entitled to compete for the Money Premiums in those districts and classes in which Proprietors are excluded from Competition. It is recommended to the Committee to take the assistance of practical men as judges in awarding the Premiums. In all cases, the Bulls for which the Money Premiums are awarded, must have served, or shall be kept to serve, the District, for at least one season, at a moderate charge for each Cow, and the rate may be fixed by the Committee. The same person is not to obtain more than one of the Premiums for Bulls, nor more than one of the Premiums for Queys, in one year, except in those Districts where Tenants compete for the Honorary and Money Premiums for Bulls, in which case they may, with different animals, carry the Medal and one of the Money Premiums. While the Directors have deemed it expedient to exclude Proprietors and Factors named on the Committee, or acting in the absence of Proprietors, from competing for the *Money Premiums* in certain Districts where it is apprehended that the superiority of their Stock might discourage competition on the part of the Tenantry, they are fully impressed with the advantages of having such Stock exhibited at the District Shows, and have offered the Honorary Silver Medal of the Society for the best Bull exhibited at the Competition, should he be the property of one in that class, and superior to the Bull to which the highest Money Premium is awarded. A Bull which, as the property of a Proprietor, may have gained the Honorary Medal, will be allowed to compete in a future year for the highest Money Premium, when *bona fide* the property and in the possession of a Tenant, provided it should have continued the Proprietor's property for at least one year after the award of the Medal, and shall have afterwards been the Tenant's property and in his possession from the day fixed by the regulations (20th May). A Bull which may have been purchased by two or more Tenants for the use of their stocks will be allowed to compete, although the exhibitors may not be joint tenants.

7. In order to entitle the Competitors to their respective Premiums, a regular Report, signed by the Convener, and at least a majority of the Committee who attend the Competition, must be transmitted by the Conveners, so as to be received by the Secretary on or before the 10th of December next, and which Report must specify the ages of the Bulls and Queys preferred; the length of time the Bulls have been in the possession of the Competitors; and, with respect to the Queys, that they were bred by the Competitors, except in the 6th District, and were their property on the day of Competition; the number of Bulls and

Queys respectively produced thereat; the number placed for Competition in each Class; the names and designations of the Persons to whom the Premiums have been adjudged; amount of Premiums voted to each; and, in general, that all the Rules of Competition fixed by the Society, as above mentioned, have been strictly observed; and in particular, that the previous intimations to the Committee of Judges, and advertisements at the church-doors, were regularly made as required. In case all the Members of the Committee who may have attended shall not have subscribed the Report, the Convener will mention the cause which may have prevented their doing so.

Further, it is to be distinctly understood, that in no instance does any claim lie against the Society for expenses attending a Show of Stock, beyond the amount of the Premiums offered.

With reference to the Competitions in the 2d, 3d, and 6th Districts, the Reports must bear that the Bulls and Queys preferred were of the West Highland breed; in the 5th and 10th, of the Fifeshire breed; and in the 4th, 7th, 8th, and 12th, of the Aberdeen breed, the 4th being limited to the Polled Aberdeenshire. A portion of the Premiums in the 9th District is authorized to be assigned to stock of the Short-horn breed, and a portion to the Ayrshire breed.

Conveners are requested to get the Reports drawn up and signed by a majority of the Committee present at the Competition before they separate.

NOTE.—The Society gives the Premiums for three Competitions in alternate years; and provided the gentlemen of the District, or any Local Association therein, shall have continued the Competitions, and have awarded and duly reported Premiums in the District to an amount not less than one-half the Society's Premiums, and for the same description of Stock, during the two intermediate years, the Society continues its Premiums to the District for an additional year. By this arrangement, each district may have the benefit of six competitions. In Districts Nos. 1, 2, 3, and 4, 1835 was the first year's competition; Local Premiums were awarded in 1836 and 1838, and this year they have the sixth or additional year's competition. In Districts 5 and 6, 1836 was the first year's competition; and this year these Districts have the Society's Premiums, which will be again given in 1841 to such of them as shall have awarded and reported Local Premiums in 1837 and 1839. In Districts Nos. 7, 8, and 9, 1838 was the first year's competition. In the Districts Nos. 10 and 11, this is the first year's competition for the Society's Premiums; they will be entitled to the Society's Premiums in 1842 and 1844, and also in 1845, if they award and report Local Premiums in 1841 and 1843. In the District No. 12, 1837 was the first year's competition; it had the Society's Premiums in 1839, and it will be this year open to the Local Premiums. In District No. 13, 1839 was the first competition for the Society's Premiums, and it will this year be open to the Local Premiums. If those two Districts award and report Premiums in the two intermediate years, they will have the Premiums for the additional year—No. 12 in 1842, and No. 13 in 1844. The Districts Nos. 14, 15, 16, and 17, are now offered for 1841 as the first year's competition, and the Premiums will be continued in 1843 and 1845, and if the Districts give Premiums in 1842 and 1844, the Society's Premiums will be again given in 1846. Farther, in order to encourage the Show for the Local Premiums, the Society, in those Districts in which the Honorary Silver Medal is offered, will continue it in the two intermediate years, under the same conditions as during the years when the Society's Premiums are given. A certificate of the Competition and Premiums awarded at the intermediate Local Shows in the several Districts, signed by at least two Members of the Society, must be transmitted to the Secretary of the Society, so as to be received by him on or before the 10th December in each year, in order to entitle the Districts to any claim for the additional year's Premiums.

## § II. WORK HORSES.

## PREMIUMS FOR IMPROVING THE BREED OF DRAUGHT-HORSES.

1. *The Upper and Middle Wards of Lanarkshire.*
2. *The District of Kintyre, Argyllshire.*
3. *The Rhinns of Galloway, Wigtonshire.*
4. *The County of Ayr.*

In each of the above Districts, Twenty-five Sovereigns will be given by the Society, a sum not less than Twenty Sovereigns additional being given by the resident Gentlemen, or by Local Societies, for the improvement of the breed of Draught-Horses. The Premiums to be as follow:—

For the best Stallion, not under three years and nine months, and not exceeding twelve years old, kept exclusively for the improvement of the breed of Draught-Horses, within each of the said Districts, Nos. 1. and 2, and for this purpose to be shewn after the Premiums have been awarded, at such stations as may be fixed by the Conveners and Committee of Members of the Society resident in the respective Districts, for service of not more than seventy Mares, at a rate not exceeding One Sovereign for each, at such times between the 1st April and the 1st August 1840, as the respective Committees may fix, at meetings to be called by the Conveners for the purpose—Twenty-five Sovereigns.

For the best Mare for breeding Draught-Horses, not exceeding twelve years old, and which shall have had at least one foal, *bona fide* the property, and in possession of, any Tenant in each of the said Districts, Nos. 1. and 2, from 1st January 1839 to the day of Competition—Ten Sovereigns.

For the best entire Colt, not exceeding forty-five months old, *bona fide* the property of any Proprietor or Tenant in the said Districts, Nos. 1. and 2.—Ten Sovereigns.

NOTE.—The Premium to the best Stallion must be awarded under the condition, that the Prize Mare, and the Mare which shall be declared by the Judges next in merit, shall have a preference of Service by the Prize Stallion, free of charge; all the competing Mares to have a preference over other Mares to service by the Prize Stallion, on such terms and conditions as the Local Committee shall fix, but the charge in no case to exceed the sum indicated by the terms of the Premium. Evidence must be produced that the Prize Stallion has had produce.

## RULES OF COMPETITION.

The time and place of Competition for the Premiums are to be fixed by the Conveners (the place of Competition for the first District to be within the Upper Ward) with the concurrence of at least a quorum of the Committee, and are to be published by the Conveners in due time at the church-doors, or in such

other manner as shall be thought by them, and a quorum of the Committee, effectual for the information of those interested.

The Competition will take place in the 1st and 2d Districts betwixt 20th March and 1st May 1840, and in the 3d and 4th Districts within the same period in 1841. The regulations for Cattle Shows, in regard to fixing the competitions—the previous intimation to the Committee and Competitors—the recommendation to the Committee to take assistance of practical men as Judges—the power of the Committee to withhold the Premiums, if the animals produced shall be of inferior character—those relating to extra expenses, and against Competitors being also Judges—and the manner in which the Reports are to be certified and transmitted to the Society, are severally hereby declared applicable to the Premiums for Horses.

The Premiums now intimated are for the second Competition in the Districts Nos. 1 and 3, and for the first Competition in the Districts Nos. 2 and 4. The expediency of continuing the Premiums for another year in the two last-mentioned Districts is open for consideration, provided the Districts shall respectively propose again to guarantee a sum equal to what they now contribute.

The Members of the Society in the respective Districts are appointed Committees for regulating every thing relative to the Competitions, with power to name Sub-Committees of their number, for attending to the necessary details.

**FOR THE FIRST DISTRICT**—The Right Hon. Lord Belhaven and Sir Norman Macdonald Lockhart, Bart., or either of them, to be Conveners of the resident Members; in their absence, Mr Rennie Scott, Factor to Lord Douglas, to be Convener; three a quorum of the Committee.

**FOR THE SECOND DISTRICT**—Richard Campbell, Esq. of Auchinbreck, and John Lorn Stewart, Esq. of Glenbuckie, or either of them, to be Conveners of the resident Members; three a quorum of the Committee.

**FOR THE THIRD DISTRICT**—The Right Hon. the Earl of Gallo-way, in his absence Colonel Hunter Blair of Dunskey, C. B., to be Convener of the resident Members; three a quorum of the Committee.

**FOR THE FOURTH DISTRICT**—Sir Charles Dalrymple Fergusson of Kilkerran, Bart., and Archibald Hamilton, Esq. of Carduie, to be Conveners of the Society's resident Members; three a quorum.

### § III. SHEEP AND WOOL.

#### PREMIUMS FOR IMPROVING THE BREED OF SHEEP IN THE FOLLOWING DISTRICTS.

1. *The Districts of Badenoch and Rothiemurchus, in Inverness-shire.*
2. *The Isle of Skye, in the County of Inverness.*
3. *The District of Cowall, Argyllshire.*



4. *The Districts of Morven, Ardnamurchan, Kingerloch, and Ardgower, Argyllshire.*
5. *The Parishes of Jedburgh, Southdean, Osnam, Orailing, Hobbirk, Bedrule, Cavers, Morebattle, Yetholm, Hournam, Linton, and Eckford, in the County of Roxburgh.*

For the best six Tups of the Black-faced Breed, not exceeding four years old, the property of any Proprietor or Tenant in each of the said Districts, Nos. 1. and 4, which shall be certified at the Competition to belong to a flock of not less than 120 Ewes, and to have been no otherwise grazed or fed during the last season than the Exhibitor's Tups of the same age, and to have served the Ewes of the flock in the same manner, and at least for one month of the season—Eight Sovereigns.

For the second best six ditto—Five Sovereigns.

For the best six Tups of the Cheviot breed, not exceeding four years old, the property of any Proprietor or Tenant in the said District No. 4, certified as aforesaid—Eight Sovereigns

For the best Pen of eighteen Gimmers or Ewes of the Black-faced breed, from sixteen to twenty months old, the property of any Proprietor or Tenant within each of the said two Districts Nos. 1. and 4, and which shall be certified at the Competition to have been at least one year in his possession, and to have been, during that year, grazed on the same kind of pasture with the remainder of the flock of the like age—Six Sovereigns.

For the second best Pen as aforesaid—Four Sovereigns.

For the best six Tups of the Cheviot breed, not exceeding four years old, the property of any Proprietor or Tenant in the said District No. 2, which shall be certified at the Competition to belong to a flock of not less than 120 Ewes, and to have been no otherwise grazed or fed during the last season than the Exhibitor's Tups of the same age, and to have served the Ewes of the flock in the same manner, and at least for one month of the season—Eight Sovereigns.

For the second best six ditto—Five Sovereigns.

For the best Pen of eighteen Gimmers or Ewes of the Cheviot breed, from sixteen to twenty months old, the property of any Proprietor or Tenant within the said District No. 2, and which shall be certified at the Competition to have been at least one year in his possession, and to have been, during that year, grazed on the same kind of pasture with the remainder of the flock of the like age—Six Sovereigns.

For the second best Pen as aforesaid—Four Sovereigns.

For the best six Tups of the Black-faced breed, not exceeding four years old, the property of any Proprietor or of any Tenant in the said District No. 3, paying *more than* L.150 of yearly rent, which shall be certified at the Competition to have been no otherwise grazed or fed during the last season than the Exhibitor's Tups of the same age, and to have served the Ewes of the flock in the same manner, and at least for one month of the season—Seven Sovereigns.

For the best six Tups of the Black-faced breed, not exceeding four years old, the property of any Tenant in the said last-mentioned District paying *not more than* L.150 of yearly rent, which shall be certified as aforesaid—Seven Sovereigns.

For the best Pen of eighteen Gimmers or Ewes of the Black-faced breed, from sixteen to twenty months old, the property of any Proprietor or of any Tenant within the said last-mentioned District paying *more than* L.150 of yearly rent, which shall be certified at the Competition to have been at least one year in his possession, and to have been, during that year, grazed on the same kind of pasture with the remainder of the flock of the same age—Five Sovereigns.

For the best Pen of eighteen Gimmers or Ewes of the Black-faced breed, from sixteen to twenty months old, the property of any Tenant within the said last-mentioned District paying *not more than* L.150 of rent, which shall be certified in the same manner as is required in the class last mentioned—Five Sovereigns.

For the best Tup, of any age, of the pure Cheviot breed, the property of any Proprietor or Tenant in the said District, No. 5, bred or bought by him, which shall have served in the District in the preceding season, or which shall so serve in the season following the competition—Seven Sovereigns.

For the best three two-year-old Tups, same breed, the property of, and bred by, any Proprietor or Tenant in the said District, No. 5.—Seven Sovereigns.

For the best pen of Five Shearling Tups, same breed, the property of, and bred by, any Proprietor or Tenant in the said District, No. 5.—Five Sovereigns.

For the best pen of Five Gimmers from the hill, same breed, the property of, and bred by, any Proprietor or Tenant in the said District, No. 5.—Five Sovereigns.

No person shall be allowed to compete in the said District, No. 5, whose stock consists of less than 120 ewes.

The following Members of the Society are appointed a Committee for awarding the Premiums :—

FOR THE FIRST DISTRICT—Sir Joseph Radcliffe, Bart.; Sir George Macpherson Grant of Ballindalloch and Invereslie, Bart.; Ewen Macpherson, Esq. of Cluny; John Macpherson Grant, Esq. younger of Ballindalloch; James Evan Bailie, Esq. of Arnisdale; Colonel Duncan Macpherson; Major Macpherson of Glentruim; Allan Macpherson, Esq. Kingussie; Captain Eneas Macpherson, Nuidmore; Captain L. Macpherson, Bialldimore; Lieutenant Alexander Macpherson, Ruthven; *and any other Members in the district*; three a quorum.—Cluny Macpherson, in his absence Major Macpherson, Glentruim, to be Convener.

FOR THE SECOND DISTRICT—Lord Macdonald; Norman M'Leod, Esq. of M'Leod; Alexander Cumming, Esq. of Grishernish; Alexander Cumming, Esq. younger of Grishernish; John Elder, Esq. at Knock; Edward Gibbons, Esq. Factor to Macleod of Macleod; John Macleod, Esq. of Rasay; John M'Lennan, Esq. of Lynedale; Donald M'Caskill, Esq. Rhudanau; Alexander M'Donald, Esq. Tormore; Hugh M'Caskill, Esq. at Talliaker; Major Allan M'Donald, Esq. of Waternish; Hugh P. M'Donald, Esq. at Moukstad; Alexander K. M'Kinnon, Esq. at Corry; Dr Farquhar Mackinnon, at Kyle; Rev. John Mackinnon of Strath; Martin Macleod, Esq. at Drynock; William Macleod, Esq. of Orhost; Charles Shaw, Esq. Factor to Lord Macdonald; *and any other Members resident in the District*; three a quorum.—Lord Macdonald and Norman Macleod, Esq. of Macleod, Conveners; in their absence, their Factors are authorized to act.

FOR THE THIRD DISTRICT—James Henry Campbell, Esq., Ardkinlas; John Campbell, Esq. of Strachur; John Campbell, Esq. of South Hall; Mungo N. Campbell, Esq. of Ballimore; Archibald Campbell, Esq. of Glendarnel; John Campbell, Esq. of Ormidale; Alexander Campbell, Esq. of Monzie; William Campbell, Esq. of Dunoon Castle; Archibald Douglas, Esq. of Glenfinart; Kirkman Finlay, Esq. of Castle-Toward; Angus Fletcher, Esq. of Dunans; James Hunter, Esq. of Hafton; Alexander Lamont, Esq. of Knockdow; Robert MacLachlan, Esq. of MacLachlan; John Macarthur Moir, Esq. of Milton; Lieutenant M'Nicol, Glenbranter; George R. Wilson, Esq. of Benmore; *and any other Members resident in the District*; three a quorum.—Robert MacLachlan, Esq. of MacLachlan, in his absence Alexander Lamont, Esq. of Knockdow, Convener.

FOR THE FOURTH DISTRICT—Sir James Milles Riddell, Bart., in his absence John Gregorson, Esq. of Ardtornish, to be Convener of the Committee of resident Members named in the advertisement of last year.

FOR THE FIFTH DISTRICT—Lord Douglas, in his absence Mr Scotland, his Lordship's Factor, to be Convener of the Society's resident Members. The Committee for this District will be named in 1841.

#### RULES OF COMPETITION.

The Competition for the Premiums in the first three Districts will take place on such days between the 1st of June and the 1st of November 1840, as shall be fixed by the Convener, with the advice of a quorum of the Committee. In the fourth District, the Competition will take place at Strontian, within the same period in 1841.

It is recommended to the Committee, as in the case of Cattle Competitions, to take the assistance of practical men as Judges in awarding the Premiums. The Judges, in deciding the Premiums for Sheep, will have regard both to the wool and carcass of the animal. The regulations for Cattle Shows, in regard to the previous intimations to Judges and Competitors—the placing of the Stock, and the number of Competitors required for Competition—the power to make provisionally an allowance for Stock of merit in the event of deficiency in number, and prohibiting Members acting as Judges who are also Competitors—the regulations relating to extra expenses—and the manner in which the Reports are to be certified and transmitted, are severally hereby declared to be applicable to the Premiums for Sheep.

The Note annexed to the Rules of Competition for the Premiums for Cattle is also applicable to the Premiums for Sheep, which will be continued by the Society for an additional period, in the several Districts, on the conditions specified in the said Note. In the first District this is the third year's Competition, and it will be entitled to the fourth or additional year's Premiums in 1841, the District having awarded Local Premiums in 1837 and 1839. In the second and third Districts, 1840 is the first year's Competition. They will have the Society's Premiums again in 1842 and 1844; and if they award Local Premiums in 1841 and 1843, they will have the additional year in 1845. In the fourth District, 1841 will be the third year for the Society's Premiums, and they will have the additional year in 1842, if they shall have awarded Local Premiums in 1838 and 1840. In the fifth District, 1841 will be the first Competition. It will have the Society's Premiums again in 1843 and 1845; and if the District award and report Local Premiums in 1842 and 1844, it will have the additional year from the Society in 1846.

The Society being desirous to promote the improvement of the several breeds of Sheep considered most suitable for the various localities of Scotland, the Directors take this mode of intimating, that they will be disposed to receive favourably applications for an increased number of Districts for Premiums to be offered for Sheep.

#### WOOL.

The following Premiums are offered to be awarded at the Perth Wool Fair in 1840:—

1. For the best sample of Leicester Wool, shown by the breeder of the stock, and consisting of not fewer than seven fleeces—Five Sovereigns.

2. For the best sample of Cheviot Laid Wool, shown by the breeder of the stock, and consisting of not fewer than seven fleeces—Five Sovereigns.

3. For the best sample of Black-faced Laid Wool, shown by the breeder of the stock, and consisting of not fewer than seven fleeces—Five Sovereigns.

Competitors for these Premiums are required to state the number of Sheep of which the Flock consisted from which the sample is taken; the gross quantity clipped; whether the fleeces are Ewe or Hog; and, if sold, the price obtained. There must be at least three Competitors for the particular description of Wool, to authorize the award of the Premium. In deciding the Premiums, it is recommended to take the assistance of Practical Farmers.

The Society's Members resident in the neighbourhood of the place of competition to be a Committee for attending to all arrangements necessary. Sir John S. Richardson, Bart. of Pitfour, in his absence Archibald Turnbull, Esq. of Bellwood, Secretary to the Perth Agricultural Society, to be Convener. The Report of the Competition to be transmitted to the Society on or before the 10th of November 1840.

Similar Premiums will be given at the Inverness Wool Fair in 1841.

#### § IV. SWINE.

##### PREMIUMS FOR IMPROVING THE BREED OF SWINE.

1. *The Islands of Orkney.*

2. *The District of Fettercairn, Kincardineshire.*

For the best Boar, not under twelve months, and not exceeding four years old, *bona fide* the property and in possession of any Proprietor or Tenant in the first District, in autumn 1840—Five Sovereigns.

For the second best—Three Sovereigns.

For the best Breeding Sow of the same age—Four Sovereigns.

For the second best—Two Sovereigns.

These Premiums to be awarded for animals that are considered most profitable and best suited for the purpose of curing mess Pork. Attention is recommended to the introduction of the Berkshire or Suffolk breed of Swine, as being the best for curing Pork.

Similar Premiums will be given in the second District in 1841,

provided the resident Gentleman, or any Local Association, award, in 1840, premiums for the same description of stock, and to an amount not less than one-half of that which was given by the Society in 1839.

The Competitions are to be held at such times and places as the Society's Members resident in the Districts shall fix at a meeting to be intimated by the respective Conveners for the purpose. This meeting is also authorized to name a Committee for managing all details, and to fix the necessary regulations for competition. A Report of the award of the Premiums, with a copy of the Regulations of Competition, to be transmitted to the Secretary on or before the 10th of December 1840 for the First District, and by the same date in 1841 for the Second District.

FOR THE FIRST DISTRICT.—James Baikie, Esq. of Tankerness; in his absence, Charles Sheriff, Esq., Sheriff-substitute of Orkney, to be Convenir.

FOR THE SECOND DISTRICT.—The Right Hon. Viscount Arbuthnot; in his absence, Sir John Stuart Forbes of Pitsligo and Fettercairn, Bart., to be Convenir.

## CLASS VII.

### PRODUCTS OF LIVE STOCK.

#### § I. CURING BUTTER.

##### DISTRICTS.

*The Island of Mull, the Districts of Ardnamurchan, Morvern, Kingerloch, and Ardgouler, in the County of Argyll.*

The Premiums given, and regulations suggested, for promoting an improved system of Curing Butter, having been productive of highly satisfactory results, the following Premiums are offered in the above District in 1841:—

To the owner of any Dairy in the said District who shall make and cure the best quality of Butter for the market, not being less than one cwt. (112 lb. the cwt. and 16 oz. the lb.) during the season 1841.—Six Sovereigns.

For the second best quality as aforesaid—Four Sovereigns.

For the third best quality as aforesaid—Three Sovereigns.

For the fourth best quality as aforesaid—Two Sovereigns.

##### CONDITIONS.

The Butter must be certified to have been made and cured on the Competitor's farm during the season 1841; and the whole quantity produced at the Competition must not be less than one cwt. The Certificate must be supported by the declaration of the Exhibitor. The butter shall be inspected by a Committee of

the Members of the Society resident within the district. The Committee, at any meeting to be called by the Convener for that purpose, shall fix such general regulations as they may consider proper; and they will, in particular, fix the place and day of Competition. The quality of the Butter to be tested by judges to be named by the Committee, in the way usually done by purchasers in the public market. In the event of two or more competing lots being deemed equal in quality, the Premium will be awarded to the larger quantity. Although not required as a condition, it is strongly recommended, as affording facilities for sales, that the Butter should be packed in firkins containing 56lb. each, or in earthen vessels which have not been glazed with preparations of lead, and of such size as may be suitable for sales. The successful candidates, before receiving the Premiums, are required to transmit to the Secretary a detailed report of the whole process followed by them in the manufacture of their Butter. Reports of the award of the Premiums to be lodged with the Secretary of the Society, on or before the 10th December 1841.

Colonel Maclean of Ardgower, in his absence Colonel Campbell of Possil, to be Convener of the Society's resident members.

## 2. MAKING CHEESE.

The Society having for a series of years given Premiums in the Dairy Districts of Scotland for the most approved descriptions of Cheese, with results highly satisfactory, specimens, at remunerating prices, having been produced of superior quality, of the finer descriptions of Cheese, it has been resolved to give further encouragement to bring forward superior Cheese, by offering Premiums open to all Scotland as follows:

### PREMIUMS.

1. For the best Cheese of the quality denominated Double Gloucester—Eight Sovereigns, or Plate of that value.
2. For the best Cheese of the quality denominated North Wiltshire—Eight Sovereigns, or Plate of that value.
3. For the best Cheese of the quality denominated Cheshire—Eight Sovereigns, or Plate of that value.
4. For the best Cheese of the quality denominated Stilton—Eight Sovereigns, or Plate of that value.
5. For the best Cheese made from Skim Milk—Eight Sovereigns, or Plate of that value.
6. For the best Cheese of any variety differing in taste and flavour from the kinds above specified, and not of the description denominated Dunlop, the manufacture of which is sufficiently known—Eight Sovereigns, or Plate of that value.

### CONDITIONS.

The several varieties above mentioned to be made in 1841, with the exception of Classes 3 and 4 (Cheshire and Stilton), which must be made in 1840. Intend-

ing Competitors must lodge, with any Member of the Society in their neighbourhood, before the 1st of June 1841, a memorandum specifying the description or descriptions of Cheese for which they intend to compete, and the quantity must not be less than 1 cwt. of any variety. Each competitor must lodge with the Secretary at the Society's Hall, on or before the 10th of December 1841, specimens of the Cheese for which he is to compete, of not less than 16 lb. imperial weight, in not more than two cheeses, accompanied by a declaration that the specimens are fair average samples of the whole cheese made by the competitor during the season, of the description for which he competes. In Class 5 the declaration must bear that neither creamed nor uncreamed milk has been used, and that the milk had not stood less than twelve hours before the cream was taken off. The declaration in the several classes to be sealed, and to bear upon the envelope a motto or mark corresponding to the distinguishing mark upon the cheese, to which it has reference.

The successful Competitors before receiving payment of their premiums shall, if required, transmit to the Society a detailed report of the whole process employed by them in the manufacture of their cheese.

The parties who gained the Premiums in Classes 1, 2, 5, and 6, at the Competitions in Edinburgh in 1838 and 1839, will not be allowed to compete for the Premiums now offered in these Classes.

Members of the Society, to whom intimation may be given by intending competitors, are particularly requested to visit the dairies, and to report upon them, and particularly upon the progress made in cheese-making in general in their district since the Society first directed attention to this important object.

## CLASS VIII.

### COTTAGES.

#### 1. PREMIUMS FOR THE BEST KEPT COTTAGES AND GARDENS.

In order to encourage Cottagers to keep their cottages and gardens neat and clean, the following Premiums will be given in the parishes after mentioned.

#### *Lanarkshire.*

**PARISH OF CULTER.**—Convener, Adam Sim, Esq. Coultermains.

**PARISH OF AVONDALE.**—Convener, George Alston, Esq. of Muirburn.

**THE PARISH OF CARLUKE.**—Convener, William Lockhart, Esq. of Milton-Lockhart.

**THE PARISH OF DALSERF.**—John Hamilton, Esq. of Fairholm.

#### *Fifeshire.*

**PARISH OF KINGHORN.**—Convener, the Earl of Rosslyn.

**PARISH OF SCOONIE.**—Convener, Major Anderson of Kingask.

**PARISH OF MARKINCH.**—Convener, John Balfour, Esq. of Balbirnie.

**PARISH OF KINNOWAY.**—Convener, J. B. Fernie, Esq. of Kilmux.



*Mid-Lothian.*

PARISH OF CARRINGTON.—Convener, the Earl of Rosebery.

PARISH OF CURRIE.—Convener, William Gibson-Craig, Esq. yr. of Riccarton, M.P.

PARISH OF LIBERTON.—Convener, Richard Trotter, Esq. of Mor-tonhall.

PARISH OF STOW.—Convener, John Borthwick, Esq. of Crookston.

*Selkirkshire.*

PARISH OF SELKIRK.—Convener, Alex. Pringle, Esq. of Whyt-bank, M.P.

PARISH OF ROBERTON.—Convener Thomas Staver, Esq. of Horecoat.

PARISH OF EYTRICK.—Convener, William Ogilvie, Esq. of Chesters.

PARISH OF YARROW.—Convener, Major-General Sir James Rus-sell of Ashiestiel, C.B.

*East-Lothian.*

PARISH OF NORTH BERWICK.—Convener, Sir George Grant Suttie, Bart.

PARISH OF PRESTONKIRK.—Convener, Sir Thomas Buchan Hep-burn, Bart. M.P.

PARISH OF ATHELSTANEFORD.—Convener, Sir David Kinloch, Bart.

PARISH OF TYNINGHAME.—Convener, the Earl of Haddington.

*The Islands of Zetland.*

PARISH OF BRESHAY.—Convener, Captain Cameron Mounl of Garth.

PARISH OF NORTHMAVING.—Convener, Henry Cheyne, Esq. yr. of Tangwick.

*County of Caithness.*

THE PARISH OF WICK.—Convener, Robert Innes, Esq. of Thurm-ster.

THE PARISH OF THURSO.—Convener, Captain Henderson of Brab-sterdorrán,

## PREMIUMS.

1. For the best kept Cottage in each of the said parishes—Two Sovereigns.
2. For the second best kept ditto—One Sovereign.
3. For the best kept Cottage-garden in each parish—One So-vereign.

CONDITIONS.

The names of intending Competitors must be intimated to the Conveners appointed by the Society, on or before the 20th of April next, otherwise they shall not be allowed to compete. The inspection of the *Cottages and Gardens* to take place between 12th June and 12th August. And, in making the inspection, the Conveners shall have power to take the assistance of any of the Members of the Society, or of any competent judge.

In order to authorize the awarding of the Premiums, the annual value of the Cottage of the Competitor, with the ground annexed, must not exceed £5 sterling, and there must at least be two Competitors in the District. No Cottage or Garden for which a Premium has been awarded by the Society, will be admitted in competition again for the same or a lower premium. If the Cottage competing is occupied by the Proprietor, the roof must be in good repair. If the roof is of thatch, it must be in good repair, though in the occupation of a tenant. The windows must be free of broken glass, and perfectly clean, and must afford the means of ventilation. Dung-hills and all other nuisances must be removed from the front and gables. The peat-stacks, if any, must be so placed as not to be a deformity; and the interior of the Cottage must be as cleanly kept as the nature of the Cottage admits of. In awarding the Cottage Premiums, the preference will be given to those who, in addition to these requisites, have displayed the greatest taste in ornamenting the exterior of their houses, with the ground in front and at the gables.

In estimating the claims of Competitors for the Garden Premium, the Judges will have in view, 1st, The sufficiency and neatness of the fence; 2d, The cleanliness of the ground, and neatness of the walks; 3d, The quality of the crops, and general productiveness of the Garden; and 4th, The choice of crops. Much advantage is derived in some districts in Scotland from Cottagers cultivating, besides the more common crops, a portion of early potatoes along with the late, of early cabbage, early pease, cauliflower, lettuce, with some gooseberry and currant bushes, and a fruit-tree trained against the wall, &c.

Reports stating that the various particulars before mentioned have been attended to, the number of Competitors, the names of the successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary of the Society, on or before the 1st day of September next.

Similar Premiums will be given for four successive years in eight additional parishes, according to priority of application, on condition that a satisfactory guarantee for one-half of the amount of the Premiums to be given, shall be lodged by each parish with the Secretary, on or before the 1st of January 1841. This privilege, however, will not be conferred on more than four parishes in the same county.

2. PREMIUMS TO PROPRIETORS FOR BUILDING COTTAGES.

1. *The County of Perth.*
2. *The County of Ayr.*

In order to mark the sense which the Society entertains of the advantages likely to result to the country, by Landed Proprietors exerting themselves to improve the style and comfort of Cottages on their estates; and in order to call the attention of such Proprietors to the subject, the Society proposes to give Premiums as undermentioned.

1. To the Proprietor who shall have erected on his estate, during the year 1840, the best and approved Cottage—The Honorary Silver Medal.

2. To the Proprietor who shall erect on his estate, during the years 1839, 1840, 1841, and 1842, the greatest number of approved Cottages—The Gold Medal.

The claims of intending Competitors for the Premium No. 1, must be lodged with the Conveners of the Committee of the Society in the said Counties, on or before the 1st of October, otherwise they shall not be entitled to compete; and for the Premium No. 2, in the same manner, on or before the 1st of October in the year 1842. The inspection of the Cottages to take place between the 1st October and the 1st November for the Premium No. 1, and between the same dates in the year 1842, for the Premium No. 2.

Reports by the Conveners to be transmitted to the Secretary of the Society on or before the 30th of November in each year.

In order to authorize the award of the Premiums, the annual value of the Cottage or Cottages separately, with garden-ground, must not exceed L.5 Sterling; and in awarding the Premium No. 2, the Cottage for which the Premium No. 1 has been awarded, shall be deducted from the number.

In estimating the claims of Competitors, the following points will be kept in view:—1st, The situation of the Cottage with reference to amenity of climate and aspect, and to the means of drainage and of preserving cleanliness. 2d, The suitableness of the structure to withstand the effects of the climate of the district. 3d, The accommodation in the interior of the Cottage, and the arrangement of out-houses attached to it. 4th, The small expense of the building compared with its durability, and with the accommodation afforded, and calculated with reference to the price of materials, and other circumstances, which may vary in different districts. 5th, The outward appearance of the Cottage or Cottages.

Parties competing to forward plans, specifications, and statements, to the Society, through the Conveners of the Districts, from which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

The Members of the Society in the respective Counties, or in the neighbourhood of the Cottages competing, are appointed Committees to inspect the Cottages, and report on the claims, with power to name Sub-Committees,

**FOR THE FIRST DISTRICT.—Sir Neil Menzies of Menzies, Bart., Hon-**

norary Secretary of the Society, and Patrick Small Kelt, Esq. of Kilmouth, to be Conveners.

FOR THE SECOND DISTRICT.—Sir Charles Dalrymple Fergusson of Kilkerran, Bart., and Archibald Hamilton, Esq. of Carcluie, Roselle, to be Conveners.

NOTE.—If the Society find the Premiums practically useful and generally approved of, they will hereafter be extended to other Counties.

### 3. COTTAGE WINDOWS.

The Windows in general use for Cottages being expensive, and otherwise objectionable,

Ten Sovereigns will be given for the best and approved Cottage Window.

The design must combine economy in the construction; efficiency in excluding rain, &c.; afford easy means of ventilation; and admit of repair with glass of the proper dimensions, furnished without the assistance of experienced tradesmen. Competitors to state the price at which they will supply the windows to the public.

A specimen of the window proposed, with a statement of the necessary particulars, to be lodged with the Secretary of the Society, on or before the 1st of September 1840.

### 4. USE OF THE SPADE.

The Society, with the view of promoting dexterity in the use of the Spade, particularly in those parts of the country where there is a redundant population, without the means of sufficient employment, will give Premiums to the amount of Two Sovereigns in each of eight parishes, for four successive years, provided a satisfactory guarantee from each parish for the application of an equal sum to the same purpose shall be lodged with the Secretary on or before the 15th of May next. The first eight Parishes lodging the guarantees to be preferred. These sums to be divided as follows:—

For the best specimen of Spade Work in each of these parishes, in a Competition, where not fewer than 15 Competitors have appeared—the sum of L.1, 10s.

For the second best, L.1, 5s

For the third best 15s And

For the fourth best 10s.

The time and place of these Competitions to be fixed by the Convener, who, with the assistance of such other Members of the Society as may attend, shall decide the Premiums. The Competitions must take place on or before the 11th of November, in the

years 1840, 1841, 1842, and 1843, and be reported on or before the 1st of December following.

Persons having gained first Premiums. to be excluded from competing in future years.

NOTE.—The Convener shall have full power to fix the quantity of ground to be turned over, the depth, and the duration of the Competition, and all other necessary arrangements.

#### 5. MEDALS TO COTTAGERS.

In the view of giving still farther encouragement to Cottagers of the description referred to under the first branch of this Class, who do not reside in Parishes in which the regular Premiums are in operation, and at the same time of giving aid to Local Associations and public-spirited individuals, establishing or continuing at their own expense Premiums for the like objects, the Society will give its Cottage Medal to such Associations or public-spirited individuals as apply for the same, and may be desirous to add that testimony of approbation to such Premiums as they themselves bestow. The number of Medals to be issued annually is limited to six.

Applications for these Medals, stating the nature and amount of the encouragement which is to be afforded by the parties applying, to be made to the Society on or before the 1st of July in each year, so that the Association or individual making the application may be enabled to intimate that the Medals are to be given. The Medals will afterwards be issued upon a Report, certified in the terms required by the preceding conditions, describing the merits of the Cottagers. The Reports to be lodged with the Secretary before the 10th November of the year in which the application is made.

#### 6. PREMIUMS TO COTTAGERS FOR PROMOTING ATTENTION TO THE CULTIVATION AND MANAGEMENT OF BEES.

1. *The Counties of Ayr and Wigton.*

2. *The County of Dumfries and the Stewartry of Kirkcudbright.*

To the Cottager in the 1st District, paying L 5 of rent or under, or whose cottage and land annexed to it does not exceed that annual value, who, between the 1st of June and 1st October 1840, shall have raised the greatest number of Hives of Bees, not fewer than seven, from stocks of his or her own property, none of the hives weighing under 20 lb. exclusive of the weight of the material of the hive or skep—A Premium of Four Sovereigns.

To the Cottager in the same District who shall have raised the second greatest number as aforesaid—Three Sovereigns.

To the Cottager in the same District who shall have raised the third greatest number—Two Sovereigns

To the Cottager in the same District who shall have raised the fourth greatest number—One Sovereign.

Certificates of the number of Hives, and their several weights, making allowance for the weight of the skeps (which must be weighed before being used), signed by two Members of the Society resident in the neighbourhood, or by one Member and the Clergyman of the Parish, to be transmitted to the Secretary on or before the 10th November 1840.

Similar Premiums will be given in the Second District for Hives raised between the 1st June and 1st October 1841.

CONVENERS FOR AYRSHIRE.—Sir Charles D. Fergusson of Kilkerran, Bart., and Archd. Hamilton, Esq. of Carluie.

CONVENERS FOR WIGTONSHIRE.—Colonel Hunter Blair of Dunskey, C. B., in his absence, Mr Murdoch, Dinvin.

*In order that the Premiums offered may be made known to the industrious Cottagers, the Society trusts much to the obliging co-operation of the Clergy in the Counties in which the Cottage Premiums are offered.*

## CLASS IX.

### WOODS AND PLANTATIONS.

#### 1. HONORARY PREMIUM FOR EXTENSIVE PLANTING.

To the Proprietor who shall, within a period of five years immediately preceding, have planted on his property the greatest extent of ground, not being less than 300 acres, and who shall communicate to the Society, on or before the 10th of November in any year, a satisfactory report of his operations, embracing the expense, description of soil, age, and kind of trees planted, the number of each sort per acre, mode of planting, extent of "beetting up," and general progress of the plantation, with such observations as his experience may suggest—The Gold Medal.

#### 2. REPORTS ON RECENT PLANTATIONS.

To the Proprietor who shall communicate to the Society, on or before the 10th of November in any year, the most satisfactory Report on the Planting of Land, founded on experiment; and who shall, accordingly, have planted on his own property an extent of not less than fifty acres, within a period of not more than ten nor less than four years preceding the date of his Report—The Gold Medal.

The Report should comprehend every interesting particular; among others, the exposure and altitude of the place, and general character of the soil—the mode of fencing and of planting adopted—the kind of trees planted, and the number of each kind per acre—their relative progress—the proportion of blanks or deaths at the end of three years—the state of the plantations at the date of making the report—and the expense per acre, as nearly as can be calculated.

### 3. NATIVE FIR WOODS.

For the best and approved account of any of the Districts of Scotland where the *Pinus sylvestris* is indigenous, and abounds so as to constitute a native forest.—The Gold Medal or Plate of the same value.

The Society has already received a Report on the Glenmore, Duthill, Rothiemurchus, and Abernethy Forests, which has been published in its Transactions. Competitors will avoid giving the same information as is there contained. No Report has been received on the Pine Forests of Aberdeenshire.

It will be expected that a view should be given both of the past and present state of the woods to which the Report has reference, and of the nature of the situations, and of the *soil* and *subsoil* where the trees appear to thrive best. It will be desirable also that measurements of some of the largest trees should be given, and a statement of their age, as far as it can be ascertained, by counting the rings or annual layers on felled trees of similar dimensions. Sections of the timber to be transmitted with the Report. The comparative growth of any other native trees which occur in the District, such as Birch or Oak, should be mentioned, and the undergrowth and general state of the pasture herbage should be described. Any circumstances which may appear to the writer likely to throw light on the growth and management of native fir woods, should be adverted to, and, in particular, how far the observation is well founded, that the best trees have a northern exposure, or are found in woods, having a north aspect or inclination.

### 4. PLANTATIONS OF *PINUS SYLVESTRIS* IN SCOTLAND.

For the best and approved Report of the Plantations of *Pinus sylvestris* in any District in Scotland—Ten Sovereigns, or Plate of that value.

It is required that the Report shall embrace a considerable District of country, and that at least two separate plantations, on different soils or exposures, be reported on, containing not less than one hundred imperial acres, and consisting of useful sized

timber, not less than forty years old; the mode of planting and after management (so far as the reporter may be enabled to ascertain the same) to be stated, as well as the return which the thinnings, &c. may have already yielded; also the yearly value of the ground before planting; together with the present value and condition of the trees and pasture.

It is further especially required, that the Reporter describe minutely the nature of the soil and subsoil, also enumerate the plants forming the natural herbage; and should any difference exist in the health and quality of the trees in different parts of the plantations, a statement of the supposed causes producing such will be necessary. Transverse sections at least six inches in depth, of the different qualities of the timber to be lodged with the Reports, which are to be lodged by the 20th of October 1840.

5. COLLECTING THE SEEDS OF THE SCOTS FIR OR *PINUS SYLVESTRIS* FROM NATIVE TREES IN SCOTLAND.

To the person in Scotland who shall, between 30th October 1836 and 30th October 1840, have collected and sown, or sold for sowing, the greatest quantity of seeds of the Scots Fir or *Pinus sylvestris*, from healthy and free growing trees of natural growth in the Highland Districts of the Counties of Aberdeen, Moray, Inverness, or Perth, the quantity to be not less than 1500 lb. clean seed—The Gold Medal, or a piece of plate of that value.

Competitors to transmit to the Secretary of the Society, on or before the 10th of November 1840, a declaration in support of the collection of the seed from proper trees, specifying the quantity collected in each year, and the district where it was gathered, stating also whether the seed had been sown or sold, and in the latter case the name of the purchaser. The expense of collecting, and, if sold, the price obtained, should likewise be reported.

6. IMPORTING THE SEEDS OF THE *PINUS SYLVESTRIS*, COLLECTED FROM TREES IN THE NATIVE FORESTS OF THE CONTINENT.

To the person in Scotland who shall, between the 30th October 1836 and 30th October 1840, have imported from Germany or Switzerland, or from Norway, Sweden, or Russia, and sown, or sold for sowing, the largest quantity of the seeds of the *Pinus sylvestris* (Kiefer, or Föhre, Roför), taken from full-grown healthy trees in those countries, but in no case from trees situated in the immediate vicinity of the sea, the quantity not to be less than 1500 lbs. of clean seed—The Gold Medal, or a piece of Plate of the same value.



Competitors to transmit to the Secretary of the Society, on or before the 10th of November 1840, evidence (the best that can be obtained) in support of the collection of the seed from proper trees, specifying the District where it was collected, and the commercial firm through whose means it was imported; also whether it had been sown in this country by the importer, or sold for that purpose, and, in the latter case, the name of the purchasers. The cost price, and, if sold, the price obtained, to be also stated.

7. INTRODUCTION OF NEW AND EXTENDING THE CULTIVATION OF THE RARER USEFUL FOREST-TREES IN SCOTTISH PLANTATIONS.

To the person who shall, on or before the 30th October in any year, report to the Society the successful introduction into Scottish Plantations, of any new ornamental or useful Forest-Tree, or the successful extended cultivation of any of the rarer useful sorts already known, but which have not hitherto received the attention which their merits would warrant—The Silver Medal, or a piece of Plate of such value as the communication may be adjudged to deserve.

Attention is more particularly directed to such trees as will grow in situations unfavourable to the health of the more generally known sorts, as elevated mountains, peaty and sandy tracts, exposed marine situations; and, in regard to the last of these, it is especially wished to ascertain the value of the *Pinus pinaster*, or the *Pinus maritima major* of the French.

Satisfactory evidence will be required, that the tree reported upon is of new or recent introduction, or that it has not hitherto received that extended cultivation which, from its value, it may have merited; and that the soil and situation for which it is recommended are congenial to its habits. A particular account of its nature and habits, nursery, and after management, uses and value of its timber, or effect in landscape scenery; and, if new, an account of its introduction must be furnished, accompanied by a specimen of the branches and foliage, and if possible, a specimen of the wood, and also of its fruit.

8. INTRODUCTION OF FOREST-TREES NOT YET KNOWN IN A LIVING STATE IN SCOTLAND.

To the person who shall, in any year, transmit to the Society, in a state fit for germination, seeds of Forest-Trees not yet in cultivation in this country, and which are natives of such places as, from their latitude or altitude, may be expected to produce

trees hardy in the climate of Scotland—The Gold or Silver Medal, or a piece of Plate of such value as the Directors, in the circumstances of the case, may think suitable.

The Society would particularly wish to direct (but by no means to confine) attention to the Fir Tribes; and the countries from which contributions are particularly expected are the north-west part of America, the table-land of Mexico, such parts of the Andes as have sufficient elevation, and the Himalaya Mountains, or the great plains to the northward of them. The seeds may be sent home in the cones, wrapped in brown paper, packed in a box, and kept in a cool airy part of the cabin, but by no means in the hold, nor in close tin cases. If Competitors possess the means, by themselves or their correspondents, of trying their vegetation in this country, it will be desirable that they should do so; but otherwise, if the seeds be sent to the Secretary of the Society, they will be tried under the direction of the Society, so as to afford every chance of success. The transmission of living plants in boxes, or in cases covered with glass, may be attempted where practicable; the external air should be excluded, and almost no water given during the voyage. Where this plan is adopted, smaller seeds, berries, or heps, may be thickly mixed with the soil or earth in which the plants are placed.

9. MORE EXTENDED INTRODUCTION OF KNOWN SPECIES OF THE FIR TRIBE.

To the person who shall, within five years from 1835, inclusive, have introduced from any part of the world, Cones containing seeds capable of germination, the produce of hardy species of the Fir Tribes which have been already introduced into Britain, but of which only a few plants have been raised—The Gold or Silver Medal, or a piece of Plate of such value as the Directors may, in the circumstances of the case, deem adequate.

It is required that the quantity of cones of each species imported shall be sufficient to afford at least 500 seedling plants; and farther, that before the premium be awarded, the number of seedling plants of each species actually raised in Scotland, shall not be less than 100. Attention is particularly directed to *Araucaria imbricata*, *Pinus ponderosa*, *Lambertiana*, and *Sabiniana*; to *Abies Douglasii*, *nobilis*, *grandis*, and *Menziesii*; and to *Taxodium sempervirens*, which last is abundant in the vicinity of St Francisco, and throughout the low sandy plains of California. Reports to be lodged by 10th November 1841.

CLASS X.  
GENERAL SHOW OF LIVE STOCK,

AND

AGRICULTURAL MEETING AT ABERDEEN IN 1840.

The Society having resolved to hold the General Show of Live Stock and Agricultural Meeting for 1840 at Aberdeen, the following Premiums are offered to be then awarded, aided by liberal donations from the Counties of Aberdeen, Forfar, Kincardine, and Banff, and from the city of Aberdeen. The Competition will be open to Stock from any part of the United Kingdom.

§ I. CATTLE.

SHORT-HORN BREED.

CLASS I. For the best Bull, calved after 1st January 1835—Twenty-five Sovereigns.

For the second best do., of same age—Fifteen Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

~~It is a condition attached to the above Premiums, that the Exhibitors shall be obliged to let out the Prize Bulls to serve in such locality of the four counties, during the season 1841, as the Local Committee shall fix. The party claiming the service must guarantee to the owner of the Bulls a payment of Twenty Guineas, and the expense of taking the animals to the places appointed, and the expense of their keep. The owner, if resident in the District, to have a preference of service for his own Stock~~

II. For the best Bull, calved after 1st January 1839—Ten Sovereigns.

For the second best do.—Five Sovereigns.

III. For the best Cow of any age—Ten Sovereigns.

For the second best do.—Seven Sovereigns.

~~NOTE.—It has been intimated by a Member of the Society, that he has induced a celebrated English Breeder to promise to send a Short-horn Cow to the Aberdeen Show, which, the Breeder states, will beat all Scotland. The Member referred to has promised, that if any Member of the Society brings forward a Cow on that occasion, which shall be preferred to the Cow of the said English Breeder, and gain the first prize, he will add Fifty Sovereigns to the Society's Premium for the best Short-horn Cow, on condition that the said Cow shall be kept in Scotland so long as she is useful as a breeder. The gentleman, of course, guards himself against the possibility of the English Cow not being brought forward, owing to any accident or circumstance over which he has no control.~~

IV For the best Heifer, calved after 1st January 1838—Seven Sovereigns.

V. For the best do., calved after 1st January 1839—Seven Sovereigns.

VI For the best two Oxen, calved after 1st January 1837—Ten Sovereigns.

ABERDEENSHIRE HORNED BREED.

VII. For the best Bull, calved after 1st January 1834—Fifteen Sovereigns.

For the second best do., calved after 1st January 1834—Ten Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

A similar condition as in Class I. The guarantee to be Ten Pounds.

VIII. For the best Cow of any age—Ten Sovereigns.

For the second best do.—Five Sovereigns

IX. For the best Ox, calved after 1st January 1836—Ten Sovereigns.

X. For the best Ox, calved after 1st January 1837—Seven Sovereigns.

ABERDEEN, ANGUS, AND GALLOWAY POLLED BREEDS.

XI. For the best Bull, calved after 1st January 1834—Fifteen Sovereigns.

For the second best do.—Ten Sovereigns.

For the third best do.—Seven Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

The same conditions as in Class VII.

XII. For the best Cow of any age—Ten Sovereigns.

For the second best do.—Seven Sovereigns.

For the third best do.—Five Sovereigns.

XIII. For the best Heifer, calved after 1st January 1838—Seven Sovereigns.

For the second best do.—Five Sovereigns.

XIV. For the best Heifer, calved after 1st January 1839—Seven Sovereigns.

For the second best do.—Five Sovereigns.

XV. For the best Ox, calved after 1st January 1836—Ten Sovereigns.

For the second best do.—Five Sovereigns.

XVI. For the best Ox, calved after 1st January 1837—Seven Sovereigns.

For the second best do.—Three Sovereigns

## WEST HIGHLAND BREED.

XVII. For the best Bull, calved after 1st January 1834—Fifteen Sovereigns.

To the *Breeder* of the best Bull in this class—The Honorary Silver Medal.

The same conditions as in Class VII.

XVIII. For the best Cow of any age—Ten Sovereigns.

XIX. For the best Heifer, calved after 1st January 1838—Five Sovereigns.

XX. For the best two Oxen, calved after 1st January 1836—Ten Sovereigns.

XXI. For the best two Oxen, calved after 1st January 1837—Seven Sovereigns.

## CROSS BREED.

XXII. For the best two Oxen, first cross between a Short-horned Bull and an Aberdeenshire, Banffshire, Forfarshire, or Kincardineshire Cow, calved after 1st January 1837—Ten Sovereigns.

For the second best two do.—Five Sovereigns.

XXIII. For the best two Oxen, same cross, calved after 1st January 1838—Seven Sovereigns.

For the second best two do.—Five Sovereigns.

XXIV. For the best two Oxen calved after 1st January 1836, a cross between a West Highland Bull, and an Aberdeenshire Horned, or Aberdeen, Angus, or Galloway Polled Cow—Five Sovereigns.

XXV. For the best two Oxen of any cross, except those above specified, calved after 1st January 1836—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

## ANY BREED.

XXVI. For the best Ox, of any breed, showing the most symmetry, fat, and weight, calved after 1st January 1836—Ten Sovereigns.

XXVII. For the best Heifer of any Breed, calved after 1st January 1836, showing symmetry, fat, and weight—Seven Sovereigns.

For the second best do.—Five Sovereigns.

XXVIII. For the best two Oxen, of the Aberdeenshire Horned, or Aberdeen, Angus, or Galloway Polled Breeds, calved after 1st January 1836—Ten Sovereigns.

## § II. HORSES.

CLASS I. For the best Stallion, for the improvement of the breed of Draught Horses, foaled after 1st January 1830—Fifty Sovereigns.

For the second best do.—Forty-five Sovereigns.

For the third best do —Forty Sovereigns.

For the fourth best do —Thirty five Sovereigns.

The Prize Horses to serve in the four counties, in season 1841, according to the arrangement which may be fixed by the Committee. The number of Mares to be served by each horse not to exceed eighty. The party claiming the service must guarantee to the owner of the horse a payment of Eighty Sovereigns, or One Sovereign for each Mare, and 2s. 6d. to the Groom for each Mare.

II. For the best Breeding Mare, for Agricultural purposes, foaled after 1st January 1828, and having had at least one Foal —Fifteen Sovereigns.

For the second best do. of same age, and having had at least one Foal—Ten Sovereigns.

III. For the best Filly for Agricultural purposes, foaled after 1st January 1838—Eight Sovereigns.

For the second best of same age—Five Sovereigns.

### § III. SHEEP.

#### BLACK-FACED BREED.

CLASS I. For the best two Tups, lambed after 1st January 1837 —Five Sovereigns.

For the second best do.—Three Sovereigns.

II. For the best pen of Four Ewes, lambed after 1st January 1835, selected from a regular breeding stock of not fewer than one hundred, and the pen having reared Lambs for the season—Five Sovereigns.

For the second best do.—Three Sovereigns.

III. For the best pen of four Wethers, any age.—Five Sovereigns.

#### LEICESTER BREED.

IV. For the best two Tups, lambed after 1st January 1837—Seven Sovereigns.

For the second best two do.—Three Sovereigns.

V. For the best pen of three Ewes, lambed after 1st January 1837, and having reared Lambs for the season—Five Sovereigns.

VI. For the best pen of three Gimmers—Three Sovereigns.

#### CHEVIOT BREED.

VII. For the best two Tups, lambed after 1st January 1837—Six Sovereigns.

For the second best—Four Sovereigns.

VIII. For the best pen of three Ewes, lambd after 1st January 1836—Five Sovereigns.

**SOUTHDOWN BREED.**

IX. For the best Tup, lambd after 1st January 1837—Five Sovereigns.

X. For the best Shearling Tup—Three Sovereigns.

XI. For the best pen of Three Ewes, lambd after 1st January 1837, and having reared Lambs for the season—Five Sovereigns.

XII. For the best pen of three Gimmers—Three Sovereigns.

**CROSSES.**

XIII. For the best pen of four Wedders, of any cross or age, the cross being specified—Four Sovereigns.

XIV. For the best pen of four Wedders, any age, a cross between a Leicester Tup and Blackfaced Ewe—Four Sovereigns.

Tups to serve in season 1841, in the four Counties, under conditions similar to those above mentioned for Bulls. A guarantee to be given of Ten Sovereigns for the service of each Tup, and the expence of conveyance and keep.

**§ IV. SWINE.**

CLASS I.—For the best Boar, farrowed after 1st January 1836—Five Sovereigns

For the second best do., of same age—Four Sovereigns.

Conditions as to service same as provided in regard to Tups.

II. For the best Sow, farrowed after 1st January 1836—Five Sovereigns.

For the second best do. of same age—Four Sovereigns.

III. For the best three Pigs, farrowed after 1st September 1839—Four Sovereigns.

For the second best do., of same age—Three Sovereigns

The breed of the Swine to be specified.

**§ V. EXTRA STOCK, IMPLEMENTS, ROOTS, AND SEEDS.**

For Extra Stock of any kind not shown for any of the above Premiums, and not exceeding in one lot five Cattle, or ten Sheep, and for Implements, Roots, Seeds, &c. Premiums, will be awarded and apportioned by the Committee and Judges, in Money, Plate, or Honorary Medals, to the value in whole of not less than Fifty Sovereigns.

**§ VI. WOOL.**

1. For the best sample of Combing Wool of seven fleeces—Five Sovereigns.

2. For the best do. of Wool of Sheep of the black-faced breed, of seven fleeces—Five Sovereigns.

Competitors for these Premiums are required to state the number of Sheep of which the flock consisted, from which the sample is taken, the gross quantity clipped, whether the fleeces are ewe or hog, and, if sold, the price obtained; and in regard to the combing wool, whether it is of the New Leicester, Cotswold, or any cross of these breeds. The Exhibitors must have bred the stock from which the wool has been obtained.

#### § VII. DAIRY PRODUCE

##### 1. CURING BUTTER.

CLASS I To the owner of any Dairy in the counties of Aberdeen, Forfar, Kincardine, and Banff, who shall have made and cured and shall exhibit at the Show, the best quality of Butter for the market; the quantity made and cured not being less than two cwt. during the season 1840—Five Sovereigns

For the second best quality—Three Sovereigns.

A declaration must be lodged with the Secretary, by the party competing, that the sample produced is a fair average of the quality made and cured by the competitors, during the season 1840

##### 2. MAKING CHEESE.

II. To the person in the said four Counties who shall produce the best specimen of Sweet or Full Milk Cheese, made of any variety that he shall find most profitable for the market, the quantity not being less than one cwt. of 112 lb. 16 oz. to the lb—Five Sovereigns.

For the second best quality—Three Sovereigns.

The whole quantity of the variety of Cheese produced, made by each Competitor during the season, must not be less than one cwt., and a declaration must be lodged that two or more Cheeses produced are a fair average of the kind competing made in that year by the Competitor.

III. To the owner of any Dairy in the said four Counties who shall have made for sale the best quality of Cheese from Skimmed Milk, not being less than one cwt. during the season 1840—Five Sovereigns.

For the second best quality of ditto—Three Sovereigns.

These Premiums are offered under the same conditions as the Premiums in Class II.



In the event of two or more lots of Butter or Cheese being deemed of equal merit, the Premiums will be awarded to the greater quantity.

#### GENERAL REGULATIONS FOR THE SHOW AT ABERDEEN.

1. The Stock must, at the date of the Competition, be *bona fide* the property and in the possession of the party in whose name they are entered, and they must have been so at least from the 1st of May 1840.

2. In estimating the ages of the Stock, Cattle will be calculated from the 1st of January of the year in which they were calved, Horses from the 1st of May of the year in which they were foaled, and Sheep from the 1st of May of the year in which they were lambed.

3. Cattle fed on distillery or brewers' wash or grains, are excluded from competition, as that food is not generally accessible. Stock which may have received oil-cake or grain, are not excluded; but where cake or grain has been used, the quantities are to be stated in the certificate.

4. Cows in competition must have had a calf, or be in calf in the year 1840. If desired, evidence must be produced that Stallions and Bulls, if four years old or upwards, for which Premiums may be awarded, had produce in the preceding year.

5. An animal having already gained a first premium, at any of the Society's General Shows, is not to be shewn again in competition in a class of a similar denomination, but may be shewn as Extra Stock.

6. The Stock to be shewn must be intimated by a Certificate for each lot, according to the forms hereto annexed. It shall be competent to the Committee, if they see fit, to require the Exhibitor, or the person in charge of the Stock, to confirm the Certificates in the presence of a Magistrate on the day of competition. Printed Certificates, to be completed with the required particulars, and to be subscribed by the Exhibitor, may be had on application at the Society's Hall, Edinburgh; or at Messrs Thomas and Newell Burnett, Belmont Street, Aberdeen. The Certificates, duly completed, must be lodged with the Secretary of the Society, or transmitted, so as to reach him at Aberdeen, or at his office in Edinburgh, at the latest fourteen days before the Exhibition. The Certificates, when lodged, are not to be communicated, except by directions of the Committee. A Competitor may shew more than one lot in any Class, but not more than three. It shall not be competent to enter a lot in one class, and to withdraw it for competition in another, except by authority of the Committee. The same lot can be entered in one Class only.

7. Besides the Stock specified in the Classes of the above list, Cattle, Horses, Sheep, and Swine, possessed of merit, may be exhibited as Extra Stock, if duly intimated by a Certificate for each lot, in a form similar to what is prescribed for the competing Classes, and lodged within fourteen days before the Competition. Stock which cannot be shewn in any competing Class, may be exhibited as Extra Stock. If any lot of Fat Stock, for which a competing Class is open, is to be entered as Extra Stock, from an impression on the part of the Exhibitor that they are too young to compete in the Classes open to them, the Judges of Extra Stock are directed to notice them specially, provided they possess merit. Implements, Seeds, Roots, Plants, &c. must be intimated by lodging with the Secretary, at least six days before the Show, a notice or memorandum specifying the articles, and communicating such particulars regarding them, as the Exhibitors may deem of interest or importance.

8. The Secretary of the Society will be at Aberdeen sixteen days before the Show to receive Certificates, and afford information to intending Competitors. In the mean time, Certificates may be lodged with him at Edinburgh, or with

Messrs Burnett, Aberdeen. A responsible person must attend at the Secretary's office at Aberdeen not later than two days before the Show, to give explanations if required, to receive instructions, and orders duly signed for the admission of the Stock to the Show ground. The person so attending must be acquainted with the various particulars required to be certified.

9. A list of the Stock entered will be made up by the Secretary fourteen days before the Show, and no Stock will be allowed to compete which is not entered in that List.

10. All Stock and other articles entered must be brought forward to the Competition unless prevented by some unavoidable cause. If not so brought forward, the owner will, if a reason, satisfactory to the Chairman of the Committee, or to the Directors, is not assigned, be liable for all expenses caused by the entry of the Stock, and any other course followed which the Committee or Directors may consider proper. The Stock and other articles must be brought to the Show-ground between the hours of six and eight o'clock of the morning of the Show, to afford time for placing them. No Stock whatever can come within the premises without having an admission order. One servant only for each lot can be admitted, and he must continue in charge of the lot in the Show Yard. Bulls must be secured by a ring or screw in the nose, with a chain or rope attached, otherwise they will not be admitted into the Show Yard. There are screws for temporary use, which Competitors will find it convenient to provide for Bulls that have not been usually ringed. The Competing Stock will be distinguished by numbers, so that the owner's name will not be known. The names referable to the numbers will be shewn by the List made up by the Secretary.

11. The arrangements for the Show will be conducted by a Committee of the Society's Members. Skilful persons will be appointed to act as Judges, who will be divided into sections to judge of the Classes with which they are best acquainted, in order to render the inspection as short as possible, and that the public may have early access to the Show-ground. The Judges, in forming their opinion, will particularly attend to the instructions hereto annexed.

12. A Member of the Committee, or of the Deputation of Directors, will be appointed to attend each section of the Judges. A servant, provided with tickets upon which shall be printed the Premium awarded, will be in attendance on the Member so appointed; and as soon as a section of the Judges shall determine which animal or animals are entitled to the Prizes in their respective Classes, the Member of the Committee or Deputation of Directors shall direct the servant to affix the Prize Tickets on the animals, and the Member is to be responsible for the Tickets being affixed accordingly, that the public may have the earliest opportunity to examine the points of the Prize Cattle. None of the Tickets so placed shall be removed. If any Prize Ticket be removed and affixed to an animal which has not obtained a Premium, the parties so offending shall be proceeded against as the Committee or Directors may appoint. The Stock shall be withdrawn and the Show-Yard shut at four o'clock.

13. All the Prize Animals shall be brought to the Show-Ground by ten o'clock in the morning of the day immediately after the Show, under penalty of the owner forfeiting the Premiums; when, after an examination by practical judges appointed by the Local Committee, it will be determined what animals shall be claimed to serve in the District, the places of service fixed, and the guarantee given in terms of the Conditions. At the same time, the Deputation of the Directors will determine if Portraits of any of the Prize Animals shall be taken for the Society's Museum, and, in the event of any being selected, the owners are required to keep them in or near the town for such a reasonable time as may be necessary to take the Portrait, under the penalty of forfeiting the Premium

The expense attending the detention, which will be limited to four days, to be paid to the owner by the Society, at a rate not exceeding 7s. 6d. per day. Those who may have Stock possessing particular merit, especially such animals as have been commended by the Judges, are invited to shew them on this day, for the gratification of practical Breeders, when a favourable opportunity may be given to sell both Breeding and Fat Stock to advantage. The Premiums to animals claimed for service will not be paid until 1st September 1811. The other Premiums will be paid with the Society's General Premiums, on or after the 10th of February 1841.

14. No change can, under any circumstances, be made upon the General Regulations established by the Society for Agricultural Meetings and General Shows of Live Stock, so far as Competitors are interested, unless regularly submitted and approved at a meeting of the Directors in Edinburgh, and duly intimated to Competitors.

His Grace the DUKE of SUTHERLAND, President, and the Vice-Presidents of the Society; the Lords-Lieutenant, Vice-Lieutenants, and Conveners of the Counties, with an adequate number of the Members of the Society, to be named at the meetings on the 30th April, by the counties more immediately connected with the Show, together with the Secretaries of the Local Agricultural Associations have been appointed a Committee for regulating all details connected with the Agricultural Meeting and General Show of Live Stock at Aberdeen. The EARL of ABERDEEN, K. T. to be Chairman of the Committee; Robert Grant, Esq. of Tillyfour, Vice-Convenor; and in his absence, Alexander Thomson, Esq. of Banchory.

A deputation of the Directors of the Society will be at Aberdeen two days before the meeting.

#### FORM OF CERTIFICATE APPLICABLE TO FAT OXEN.

I            near the post town of           , in the county of           , do certify, That my Ox (or Oxen, as the case may be), of the            breed, to be shewn at the General Show of Live Stock at Aberdeen, for the Premium in class            was bred by Mr           , of           ; he was calved after 1st January 18           , and, calculating from the said 1st January, will, at the date of the Show, be            years and            months old, and has been fed by me on           . The quantity of cake or corn he has consumed has been           . He has not at any time been fed on distillery or brewers' wash or grains. He will have to travel on foot (or by steam, or other conveyance, as the case may be)            miles, or thereby, from the place of feeding to the Show at Aberdeen. He was first put up to fatten on or about the            day of           . Witness my hand this            day of            1840.

*(Signature of the Exhibitor.)*

Any observations as to the animal's appearance and state of flesh when put up to feed, or other particulars which the Exhibitor may think material, and more especially the pedigree, may be subjoined to the above certificate.

#### FORM OF CERTIFICATE APPLICABLE TO CATTLE—LEAN OR BREEDING STOCK.

I            of           , near           , in the county of           , do certify, That my           , of the            breed, to be shewn at the General Show of Live Stock, at           , for the Premium in class           , bred by           , and purchased by me from           , on or about           , calved after 1st January           , and, calculating from the said 1st of January, will, at the date of the Show, be            years and            months old, and since            been in my possession, food            been            will have to travel on foot            miles or thereby, to the Show at Aberdeen. Witness my hand this            day of            1840.

*(Signature of the Exhibitor.)*

N.B.—Any observations, with reference to other particulars which the Exhibitor may think material, may be subjoined to the above certificate. The Pedigree, when known, must also be stated.

FORM OF CERTIFICATE APPLICABLE TO HORSES, SHEEP, OR SWINE.

I, _____, of _____, near _____ in the county of _____, do certify, That my _____, of the _____ breed, to be shewn at the General Show of Live Stock, at _____ for the Premium in class _____, bred by _____, and purchased by me from _____, foaled (lambled, or pigged, as the case may be), after 1st of (June for horses, and May for sheep), and, calculating from said 1st of June (or May), will, at the date of the Show, be _____ years and _____ months old, and since _____ been in my possession, _____ food _____ been _____, will have to travel on foot _____ miles or thereby, to the Show at Aberdeen. Witness my hand this _____ day of _____ 1840.

*(Signature of the Exhibitor.)*

N.B.—Any observations, with reference to other particulars which the Exhibitor may think material, may be subjoined to the above certificate. The Pedigree, when known, must also be stated.

INSTRUCTIONS TO THE JUDGES. .

1. The Judges will assemble, on the morning of the Show, at the time and place to be appointed by the Committee. When it is intimated that the Stock is ready to be examined, the Judges will proceed to the respective Classes which have been assigned to them. Without inquiry as to the names of parties or places, they will decide upon the merits of the animals, and their awards shall make reference merely to the *numbers* which distinguish the animals. The Judges will receive from the Secretary blank Reports, to be completed by them with the awards of the Premiums. In this Report, the *numbers* referable to the lots recommended must be distinctly written in words, and not in figures. The Judges will report not only those animals entitled to Premiums, but also the next in merit in each Class, to meet the contingency of any challenge which may be made against the Prize animals. They will also point out any animals, portraits of which they may consider should be taken for the Society's new Museum. They will sign and deliver their Report, and they are not afterwards to propose any change. In the event of a difference of opinion, the majority of the Judges who have examined the Lot shall be conclusive. When the Report is delivered to the Committee, the duty of the Judges shall cease, and the Committee shall award the Premiums.

2. The Judges, in examining the Stock, will proceed on the understanding that the Committee are satisfied with the regularity of the Certificates; but if any of the Stock does not, in their opinion, come within the Regulations, or is of such a character as ought not to be exhibited, they will state their opinion to the Committee, that such course may be adopted as shall appear necessary. Should the Judges desire to have the information communicated in the Certificates, as to the mode of feeding, or other particulars, they will apply for the same to the Committee, through the Secretary.

3. The Judges will have regard to the symmetry, early maturity, purity, size and general qualities characteristic of the breeds of which they judge. They will make due allowance for age, feeding, and other circumstances bearing on the character and condition of the animals. They will not give encouragement for over-fed animals. They will not award Premiums for Bulls, Cows, or Heifers, which shall appear to have been fattened for the butcher, the object being to have superior animals of these descriptions for breeding. In no case shall a Premium be adjudged, unless the Judges shall deem the animals to have sufficient merit; more especially if only one lot is presented for any of the Premiums.

CLASS XI.  
GENERAL SHOW OF LIVE STOCK,

AND

AGRICULTURAL MEETING AT BERWICK IN 1841.

The Society having resolved to hold the General Show of Live Stock and Agricultural Meeting for 1841 at Berwick, the following Premiums are offered to be then awarded, aided by liberal donations from the Noblemen, Gentlemen, and Agricultural Associations in the Counties more immediately interested.

§ I. CATTLE.

SHORT-HORN BREED.

CLASS I.—For the best Bull, calved after 1st January 1837—Fifty Sovereigns.

For the second best do —Thirty Sovereigns.

To the *Breeder* of the best Bull in this class—The Honorary Silver Medal

II. For the best Bull, calved after 1st January 1840—Twenty Sovereigns

III. For the best Cow—Fifteen Sovereigns.

For the second best Cow—Ten Sovereigns.

IV. For the best three Cows—Fifteen Sovereigns.

V. For the best Heifer, calved after 1st January 1839—Ten Sovereigns.

For the second best do.—Seven Sovereigns.

For the third best do.—Five Sovereigns.

VI. For the best Heifer, calved after 1st January 1840—Ten Sovereigns.

For the second best do.—Five Sovereigns.

VII. For the best three Heifers, calved after 1st January 1839—Fifteen Sovereigns.

VIII For the best two Oxen, calved 1st January 1838—Twelve Sovereigns.

For the second best two ditto—Eight Sovereigns.

IX. For the best two Oxen, calved after 1st January 1839—Twelve Sovereigns

For the second best two do.—Eight Sovereigns.

GALLOWAY, ANGUS, AND ABERDEEN POLLED BREEDS.

X. For the best two Oxen, calved after 1st January 1837—Fifteen Sovereigns

For the second best two do —Ten Sovereigns.

AYRSHIRE BREED.

XI. For the best Cow—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

WEST HIGHLAND BREED

XII. For the best two Oxen, calved after 1st January 1837—Fifteen Sovereigns.

For the second best two do.—Ten Sovereigns.

XIII For the best two Oxen, calved after 1st January 1839—Bred by the Exhibitor, never housed—Ten Sovereigns.

XIV. For the best two Cows—Ten Sovereigns.

ANY BREED.

XV. For the best two Oxen, pure or crossed, calved after 1st January 1837—Fifteen Sovereigns.

XVI. To the Owners of the five best Steers, calved after 1st January 1840, which, in the opinion of the Judges, will best remunerate the feeder—Fifteen Sovereigns.

XVII To the Owners of the five best Heifers, calved after 1st January 1840, which, in the opinion of the Judges, will best remunerate the feeder—Fifteen Sovereigns.

§ II. HORSES.

I. For the best Cart Stallion, not exceeding eight years—Fifty Sovereigns.

For the second best do.—Twenty-five Sovereigns.

For the third best do —Fifteen Sovereigns

II. For the best thorough-bred Stallion—Twenty Sovereigns.

The Prize Horses to serve in season 1842, according to the arrangement which may be fixed by the Committee. The number of Mares to be served by each horse not to exceed eighty. The party claiming the service must guarantee to the Owner of the Horse a payment of Eighty Sovereigns, or One Sovereign for each Mare, and 2s. 6d to the Groom for each Mare.

III. For the best Cart Mare—Fifteen Sovereigns.

For the second best do.—Ten Sovereigns.

IV. For the best Mare for breeding Hunters—Ten Sovereigns.

V. For the best Filly or Colt for agricultural purposes, foaled after 1st January 1838—Five Sovereigns.

VI. For the best do. foaled after 1st January 1839—Four Sovereigns.

VII. For the best do. foaled after 1st January 1840—Three Sovereigns.

## § III. SHEEP.

## LEICESTER BREED.

CLASS I.—For the best Tup—Twenty Sovereigns.

For the second best do.—Fifteen Sovereigns.

For the third best do.—Ten Sovereigns.

II. For the best shearling Tup—Twenty Sovereigns.

For the second best do.—Fifteen Sovereigns.

For the third best do.—Ten Sovereigns.

III. For the best pen of five Ewes—Ten Sovereigns.

For the second best do.—Five Sovereigns

IV. For the best pen of five Gimmers—Ten Sovereigns.

For the second best do.—Five Sovereigns.

V. For the best pen of five Dinmonts—Five Sovereigns.

## CHEVIOT BREED.

VI. For the best three Tups—Fifteen Sovereigns.

For the second best three do.—Ten Sovereigns.

VII. For the best three shearling Tups—Ten Sovereigns.

For the second best three do.—Five Sovereigns.

VIII. For the best pen of ten Ewes—Ten Sovereigns.

For the second best ten do.—Five Sovereigns.

IX. For the best pen of ten Gimmers—Ten Sovereigns.

For the second best ten do.—Five Sovereigns.

X. For the best ten fat Wedders, lambed in 1838—Five Sovereigns.

## BLACK-FACED BREED.

XI. For the best three Tups—Ten Sovereigns.

XII. For the best pen of ten Ewes—Five Sovereigns.

XIII. For the best ten fat Wedders, lambed in 1838—Five Sovereigns.

## SOUTHDOWN BREED.

XIV. For the best Tup—Ten Sovereigns.

XV. For the best pen of five Ewes—Five Sovereigns.

## CROSSES.

XVI. For the best pen of five Dinmonts, cross between Leicester Tup and Cheviot Ewe—Five Sovereigns.

XVII. For the best pen of five do., cross between Leicester Tup and Black-faced Ewe—Five Sovereigns.

XVIII. For the best pen of five Wedders, of any cross and age—Five Sovereigns.

§ IV. SWINE.

- I. For the best Boar—Five Sovereigns.  
For the second best do.—Four Sovereigns.
- II. For the best Sow—Five Sovereigns.  
For the second best do.—Four Sovereigns.

§ EXTRA STOCK, IMPLEMENTS, ROOTS, AND SEEDS.

For Extra Stock of any kind not shewn for any of the above Premiums, and not exceeding in one lot five Cattle or ten Sheep, and for Implements, Roots, Seeds, &c. Premiums will be awarded and apportioned by the Committee and Judges, in Money, Plate, or Honorary Medals, to the value in whole of not less than Fifty Sovereigns.

GENERAL REGULATIONS FOR THE SHOW AT BERWICK.

1. The Competition will take place at Berwick in the end of September, or beginning of October, 1841. The particular day will be afterwards intimated. The Competition will be open to Stock from any part of the United Kingdom.

2. The name, residence, and post-town of the Exhibitor, the name of the Breed, the number of the Class in which the animals are to be exhibited, their age, and, in the case of Fat Stock, the kind of food on which they have been fed, must be regularly certified. Forms of the necessary Certificates, and information as to the period when they fall to be lodged, will in due time be furnished.

3. It is required, that the Stock shall have been *bona fide* the property, and in the possession of the Exhibitor, from 1st May of the year in which the Show is to be held. Evidence must be produced, if desired, that the Stallions and Bulls for which Premiums are awarded have had produce during the preceding year, provided they are four years old and upwards.

4. No Cattle fed on distillery or brewer's wash or grains (which are accessible to a few Competitors only) will be allowed to compete. Cows exhibited for Premiums must have had a Calf, or be in Calf during the year of the Show, Feeding on oil-cake or grain is not excluded; but, if used, the quantity to be specified.

5. The distance each animal travels to the Show, and, in the case of Fat Stock, the date of being put to fatten, to be mentioned.

6. A Competitor may shew more than one Lot in any Class. It shall not be competent to enter a Lot in one Class, and afterwards to withdraw it for competition in another Class, unless by the directions of the Committee. An animal having already gained the first Premium in its Class, at any of the Society's General Shows of Stock, is not to be shewn again in competition in a Class of the same denomination, but may be exhibited as Extra Stock.

7. Stock, which cannot be shewn in any competing Class, may be exhibited as Extra Stock. If any Lot of Fat Stock, for which a competing Class is open, is to be entered as Extra Stock, from an impression on the part of the Exhibitor that they are too young to compete in the Classes open to them, the Judges of Extra Stock will be directed to notice them specially, provided they possess merit.

8. The Judges will be instructed not to award Premiums to Cows, Bulls, or other Breeding Stock, which shall appear to have been fattened for the butcher;



the object being to encourage such Stock for the purpose of breeding They will also be instructed to discourage overfed animals.

9. The other Regulations referable to General Shows will be published in due time for the information of Competitors In the mean time, intending Competitors are referred to those published for the Aberdeen Meeting in 1840. The Male Stock shewn at Berwick, with the exception of Stallions, will not be required to serve in the District

### THE VETERINARY SCHOOL.

This Establishment is conducted under the superintendence of Mr Dick, Veterinary Surgeon, the Lecturer appointed by the Society. Students receive instruction in the anatomy and diseases of the horse and other domestic animals, in the best system of treatment and cure, in stable management, and in the most approved and scientific modes of shoeing. The Students are sent to the Class by Local Agricultural Associations, or attend on their own account. The hour of lecture is accommodated to the convenience of Students attending the Agricultural and other classes in the University. Those Students who attend two courses, and are afterwards found qualified at the Annual Examination by the Committee of Medical Examinators, receive certificates. Graduates of the School under the Society's patronage are now eligible for Veterinary Surgeons in the Army and East India Company's service

Mr Dick occasionally delivers a popular course of Lectures to a class of Gentlemen. It may be also observed, that several of the principal Lecturers in different branches of Medical Science, have for some years given free admission to their classes to those Veterinary Students who intend to practice.

The Lectures and Demonstrations for the Session 1841-42, will be commenced in November next, at the Lecture-room in Clyde Street, Edinburgh.

By order of the Directors,

CHARLES GORDON, *Secretary.*





**L. A. B. I. 75.**

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